

* STIC SEARCH *

Hertzog 10/693,476

Page 1

=> file reg

FILE 'REGISTRY' ENTERED AT 11:02:41 ON 05 NOV 2004
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FILE 'REGISTRY' ENTERED AT 10:05:55 ON 05 NOV 2004
L1 10676 SEA (N(L)H(L)MO(L)S)/ELS
E AMMONIUM MOLYBDATE/CN
L2 74 SEA AMMONIUM#(A)MOLYBDATE#
L3 34 SEA L2 AND 4/ELC.SUB
L4 40 SEA L2 NOT L3
E HYDROGEN SULFIDE/CN
L5 1 SEA "HYDROGEN SULFIDE"/CN

FILE 'HCA' ENTERED AT 10:41:50 ON 05 NOV 2004
L6 4008 SEA L3
L7 97090 SEA L5 OR HYDROGEN#(W) (SULFIDE# OR SULPHIDE#) OR H2S
L8 4565 SEA L1
L9 21 SEA L6 AND L7 AND L8

FILE 'REGISTRY' ENTERED AT 10:42:28 ON 05 NOV 2004
E SULFUR/CN
L10 1 SEA SULFUR/CN
L11 228 SEA S/ELS (L) 1/ELC.SUB

FILE 'HCA' ENTERED AT 10:47:47 ON 05 NOV 2004
L12 176708 SEA L10 OR L11 OR (ELEMENTAL? OR PURE# OR PURIF? OR
FREE? OR UNBOUND? OR NONBOND? OR NON(A)BOND?) (2A) (SULFER#
OR SULFUR# OR SULPHER# OR SULPHUR# OR S)
L13 1 SEA L9 AND L12
L14 9 SEA L7 AND L12 AND L6
L15 5737 SEA AMMONI?(A)MOLYBDATE#
L16 10 SEA L7 AND L12 AND L15

FILE 'REGISTRY' ENTERED AT 10:51:22 ON 05 NOV 2004
E AMMONIUM THIOMOLYBDATE/CN
L17 99 SEA L1 AND 13/S
L18 119 SEA L1 NOT C/ELS
L19 15 SEA L17 AND L18
L20 509 SEA L1 AND 3/MO
L21 13 SEA L19 AND L20

FILE 'HCA' ENTERED AT 10:54:19 ON 05 NOV 2004

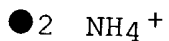
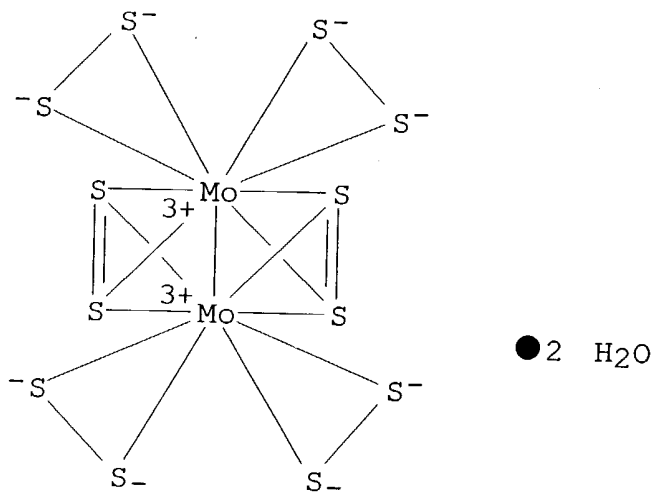
L22 59 SEA L21
L23 15 SEA L21/P
L24 16 SEA L22 AND (L6 OR L7 OR L12 OR L15)
L25 38 SEA (L14 OR L16 OR L23 OR L24) NOT L13
L26 16 SEA (L14 OR L16) NOT L13
L27 20 SEA L9 NOT (L13 OR L26)
L28 20 SEA (L23 OR L24) NOT (L13 OR L26 OR L27)

=> file hca

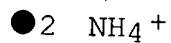
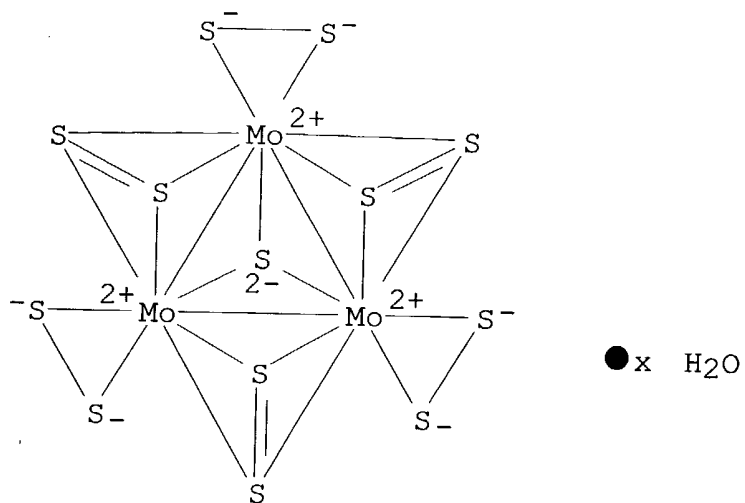
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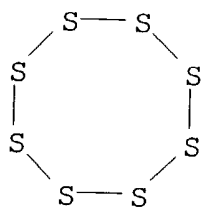
L13 ANSWER 1 OF 1 HCA COPYRIGHT 2004 ACS on STN
114:113911 Molybdenum-sulfur clusters. Mueller, Achim; Krickemeyer,
Erich (Fac. Chem., Univ. Bielefeld, Bielefeld, D-4800, Germany).
Inorganic Syntheses, 27, 47-51 (English) 1990. CODEN: INSYA3.
ISSN: 0073-8077.
AB (NH₄)₂[Mo₃S(S₂)₆].nH₂O (n = 0-2) and (NH₄)₂[Mo₂(S₂)₆].2H₂O were
prepd. individually and together from polysulfide solns. and
(NH₄)₆[Mo₇O₂₄] or (NH₄)₂[MoO₂S₂] under different reaction
conditions. The polysulfides were prepd. from S₈ and H₂S
and NH₃.
IT 65878-95-7P 79950-09-7P
(prepn. of)
RN 65878-95-7 HCA
CN Molybdate(2-), bis[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa
.S')]tetrakis(dithio)di-, (Mo-Mo), diammonium, dihydrate (9CI). (CA
INDEX NAME)



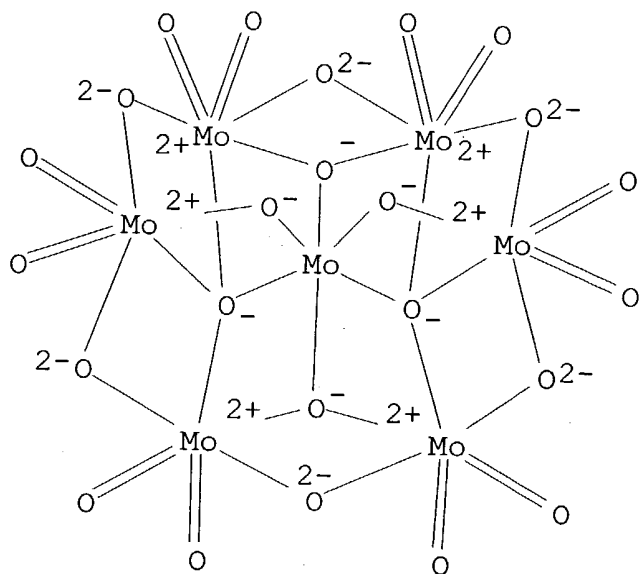
RN 79950-09--7 HCA
 CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, hydrate
 (9CI) (CA INDEX NAME)



IT 10544-50-0, Sulfur (S₈), reactions
 (reaction of, with **hydrogen sulfide** and
 ammonia followed by oxomolybdate or oxothioxomolybdate)
 RN 10544-50-0 HCA
 CN Sulfur, mol. (S₈) (7CI, 8CI, 9CI) (CA INDEX NAME)

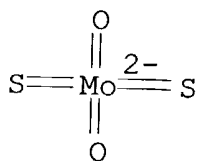


IT 12027-67-7 16150-60-0
 (reaction of, with polysulfide)
 RN 12027-67-7 HCA
 CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

RN 16150-60-0 HCA
 CN Molybdate(2-), dioxodithioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



● 2 NH_4^+

CC 78-7 (Inorganic Chemicals and Reactions)
 IT 65878-95-7P 79950-09-7P
 (prepn. of)
 IT 10544-50-0, Sulfur (S8), reactions
 (reaction of, with **hydrogen sulfide** and
 ammonia followed by oxomolybdate or oxothioxomolybdate)
 IT 12027-67-7 16150-60-0

(reaction of, with polysulfide)

=> d 126 1-16 cbib abs hitstr hitind

L26 ANSWER 1 OF 16 HCA COPYRIGHT 2004 ACS on STN

141:209697 The hydrodesulfurization activity and characterization of cobalt Chevrel phase sulfides. Ooi, Shukeat; Zhang, Haibo; Hinode, Hirofumi (Department of International Development Engineering, Tokyo Institute of Technology, Meguro, Tokyo, 152-8552, Japan). Reaction Kinetics and Catalysis Letters, 82(1), 89-95 (English) 2004. CODEN: RKCLAU. ISSN: 0133-1736. Publisher: Akademiai Kiado.

AB Hydrodesulfurization activity of cobalt Chevrel phase sulfide catalysts was studied in a fixed-bed flow reactor. Single phase cobalt Chevrel phase sulfides exhibited catalytic activity for hydrodesulfurization. Supported cobalt Chevrel phase sulfides catalysts indicated much higher hydrodesulfurization activity and even higher than com. CoMoS/Al₂O₃ catalysts. The existence of Mo₆S₈ and the reduced oxidn. state of Mo in the cobalt Chevrel phase sulfides was obsd. by XRD, LRS, and XPS.

IT 7704-34-9, Sulfur, reactions 7783-06-4,
Hydrogen sulfide (H₂S), reactions
(hydrodesulfurization activity and characterization of cobalt Chevrel phase sulfides)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

RN 7783-06-4 HCA

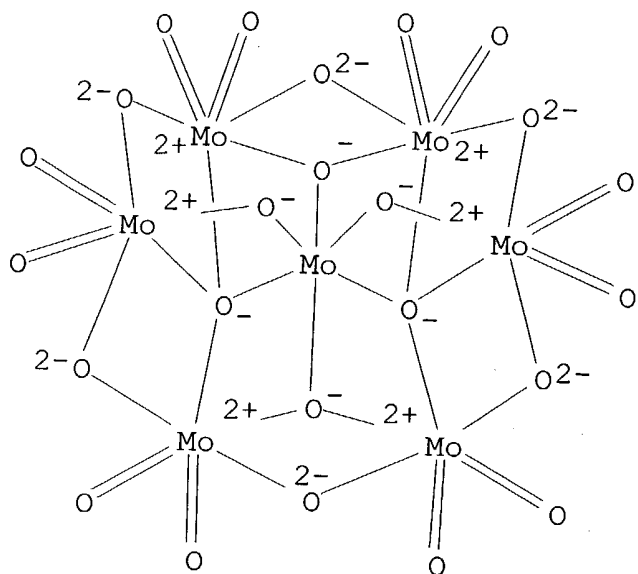
CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

IT 12054-85-2, Hexaammonium heptamolybdate tetrahydrate
(precursor; hydrodesulfurization activity and characterization of cobalt Chevrel phase sulfides)

RN 12054-85-2 HCA

CN Molybdate (Mo70246-), hexaammonium, tetrahydrate (9CI) (CA INDEX NAME)

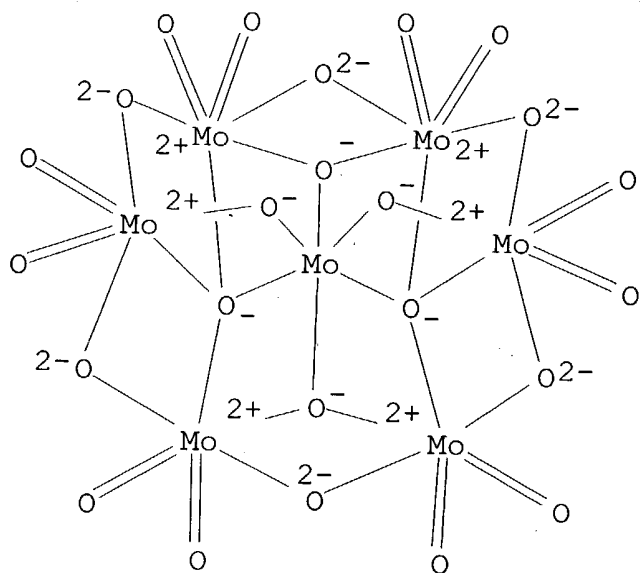


● 4 H₂O

● 6 NH₄⁺

- CC 51-6 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 22, 67, 75
- IT 1333-74-0, Hydrogen, reactions 7704-34-9, Sulfur, reactions 7783-06-4, **Hydrogen sulfide (H₂S)**, reactions (hydrodesulfurization activity and characterization of cobalt Chevrel phase sulfides)
- IT 10026-22-9, Cobalt nitrate, hexahydrate 12054-85-2, Hexaammonium heptamolybdate tetrahydrate (precursor; hydrodesulfurization activity and characterization of cobalt Chevrel phase sulfides)
- L26 ANSWER 2 OF 16 HCA COPYRIGHT 2004 ACS on STN
- 138:257592 Hydrogenation of coals from the Yerkovetsk field to obtain liquid fuel. Maloletnev, A. S.; Krichko, A. S.; Golovin, G. S.; Pyataev, D. A. (Inst. Goryuchikh Iskopaemykh, Russia). Khimiya Tverdogo Topliva (Moscow, Russian Federation) (6), 40-50 (Russian) 2002. CODEN: KTVTBY. ISSN: 0023-1177. Publisher: Nauka.
- AB The feasibility of Yerkovetsk field coal of the Amursk region for use as raw materials for liq. fuel from low pressure hydrogenation was tested and results are presented. Brown coal from this field is from a reservoir in mountainous geol. deposits, plentiful, but of low calorific value, low sulfur, and can be, and can prospectively

be hydrogenated to manuf. liq. motor fuel with new technol.
 IT 12027-67-7, Ammonium paramolybdate
 (hydrogenation of coals from the Yerkovetsk field to obtain liq.
 fuel)
 RN 12027-67-7 HCA
 CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

IT 7704-34-9, Sulfur, uses
 (hydrogenation of coals from the Yerkovetsk field to obtain liq.
 fuel)
 RN 7704-34-9 HCA
 CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

IT 7783-06-4, Hydrogen sulfide, formation
 (nonpreparative)
 (hydrogenation of coals from the Yerkovetsk field to obtain liq.
 fuel)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H_2S) (8CI, 9CI) (CA INDEX NAME)

H₂S

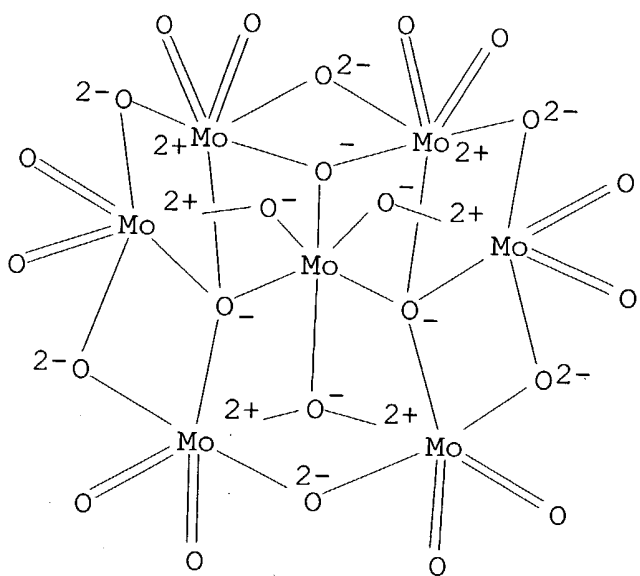
- CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
- IT 12027-67-7, Ammonium paramolybdate
(hydrogenation of coals from the Yerkovetsk field to obtain liq. fuel)
- IT 7704-34-9, Sulfur, uses 9005-53-2, Lignin, uses
(hydrogenation of coals from the Yerkovetsk field to obtain liq. fuel)
- IT 124-38-9, Carbon dioxide, formation (nonpreparative) 630-08-0,
Carbon monoxide, formation (nonpreparative) 7783-06-4,
Hydrogen sulfide, formation (nonpreparative)
(hydrogenation of coals from the Yerkovetsk field to obtain liq. fuel)
- L26 ANSWER 3 OF 16 HCA COPYRIGHT 2004 ACS on STN
- 138:92256 Catalyst for oxidizing **hydrogen sulfide**
gas and method for recovering **elemental sulfur**
using the same. Chung, Jong Shik; Shin, Moon Young (Envichem Co.,
Ltd., S. Korea; Pohang University of Science & Technology). U.S. US
6506356 B1 20030114, 10 pp. (English). CODEN: USXXAM.
APPLICATION: US 2000-685302 20001010. PRIORITY: KR 1999-43783
19991011.
- AB A catalyst for recovering **elemental sulfur** by
the selective oxidn. of **hydrogen sulfide** is
represented by the following chem. formula: VaTibXcOf wherein, a is
such a mole no. that vanadium amts. to 5-40% by wt. based on the
total wt. of the catalyst; b is such a mole no. that titanium amts.
to 5-40% by wt. based on the total wt. of the catalyst; X is an
element selected from the group consisting of Fe, Mn, Co, Ni, Sb and
Bi; c is such a mole no. that X amts. to 15% by wt. or less based on
the total wt. of the catalyst; and f is such a mole no. that oxygen
is contained to the final 100% by wt. The catalyst can recover
elemental sulfur at high rates for a long period
of time without being deteriorated in activity. The high catalytic
activity is maintained even when excess water is present in the
reaction gas.
- IT 7704-34-9P, Sulfur, preparation
(catalyst for oxidizing **hydrogen sulfide** gas
and method for recovering **elemental sulfur**
using the same)
- RN 7704-34-9 HCA
- CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

IT 7783-06-4, Hydrogen sulfide, reactions
 12027-67-7, Ammonium molybdate
 (catalyst for oxidizing hydrogen sulfide gas
 and method for recovering elemental sulfur
 using the same)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

RN 12027-67-7 HCA
 CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



●6 NH₄⁺

IC ICM C01B017-02
 NCL 423573100; 423576800; 502303000; 502304000; 502305000; 502324000;
 502325000; 502340000; 502349000; 502350000
 CC 49-1 (Industrial Inorganic Chemicals)
 ST oxidn catalyst hydrogen sulfide
 elemental sulfur manuf
 IT Oxidation catalysts
 (catalyst for oxidizing hydrogen sulfide gas
 and method for recovering elemental sulfur)

- using the same)
- IT 7439-89-6, Iron, uses 7439-91-0, Lanthanum, uses 7439-95-4, Magnesium, uses 7439-96-5, Manganese, uses 7439-98-7, Molybdenum, uses 7440-02-0, Nickel, uses 7440-24-6, Strontium, uses 7440-31-5, Tin, uses 7440-32-6, Titanium, uses 7440-33-7, Tungsten, uses 7440-36-0, Antimony, uses 7440-45-1, Cerium, uses 7440-46-2, Cesium, uses 7440-47-3, Chromium, uses 7440-48-4, Cobalt, uses 7440-62-2, Vanadium, uses 7440-66-6, Zinc, uses 7440-67-7, Zirconium, uses 7440-69-9, Bismuth, uses 7440-70-2, Calcium, uses 7631-86-9, Silica, uses 138161-54-3, Iron titanium vanadium oxide 485385-60-2, Iron molybdenum titanium vanadium oxide 485385-61-3
(catalyst for oxidizing **hydrogen sulfide** gas and method for recovering **elemental sulfur** using the same)
- IT 7704-34-9P, Sulfur, preparation
(catalyst for oxidizing **hydrogen sulfide** gas and method for recovering **elemental sulfur** using the same)
- IT 144-62-7, Oxalic acid, reactions 3087-37-4 7646-78-8, Tin chloride (SnCl_4), reactions 7697-37-2, Nitric acid, reactions 7773-01-5, Manganese chloride (MnCl_2) 7779-88-6, Zinc nitrate 7783-06-4, **Hydrogen sulfide**, reactions 7803-55-6, Ammonium vanadate (NH_4VO_3) 10025-91-9, Antimony chloride (SbCl_3) 10361-44-1, Bismuth nitrate 10421-48-4, Iron nitrate ($\text{Fe}(\text{NO}_3)_3$) 12027-67-7, **Ammonium molybdate** 13548-38-4, Chromium nitrate ($\text{Cr}(\text{NO}_3)_3$) 13693-11-3, Titanium sulfate ($\text{Ti}(\text{SO}_4)_2$) 27774-13-6, Vanadium oxide sulfate ($\text{VO}(\text{SO}_4)$) 224645-75-4, Ammonium tungstate ($(\text{NH}_4)_6\text{W}_{12}\text{O}_{39}$)
(catalyst for oxidizing **hydrogen sulfide** gas and method for recovering **elemental sulfur** using the same)
- L26 ANSWER 4 OF 16 HCA COPYRIGHT 2004 ACS on STN
- 129:97437 Analysis of organic sulfur via catalytic hydrodesulfurization. Summan, Abdel-Hadi. M. (Chemistry Department, Faculty of Applied Science, Makkah Al-Mukarramah, Saudi Arabia). Analytical Letters, 31(9), 1623-1630 (English) 1998. CODEN: ANALBP. ISSN: 0003-2719. Publisher: Marcel Dekker, Inc..
- AB Three types of hydrodesulfurization (HDS) catalysts, namely; Co-Mo/ Al_2O_3 , Ni-Mo/ Al_2O_3 and Ni-W/ Al_2O_3 with various contents of group VI (Mo and W) and group VIII (Co and Ni) oxides, but with a fixed ratio of 4:1, resp., were prepd. via impregnating .gamma.- Al_2O_3 pellets with solns. contg. cobalt or nickel nitrate and **ammonium molybdate** or tungstate. After drying and calcination, the catalysts were then sulfided in situ in the reactor. Two refractory sulfur compds., namely; benzothiophene and dibenzothiophene, were tested for a complete HDS on the prepd.

catalysts. Some catalyst preps. reached quant. transformation of the thiophenic compds. under study to **H2S** at a temp. of 450.degree.C in a H2 flow of 20 cm3 min-1.

IT 7704-34-9, Sulfur, analysis
(anal. of org. sulfur via catalytic hydrodesulfurization)
RN 7704-34-9 HCA
CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 51-3 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 67, 79
IT 7704-34-9, Sulfur, analysis
(anal. of org. sulfur via catalytic hydrodesulfurization)

L26 ANSWER 5 OF 16 HCA COPYRIGHT 2004 ACS on STN

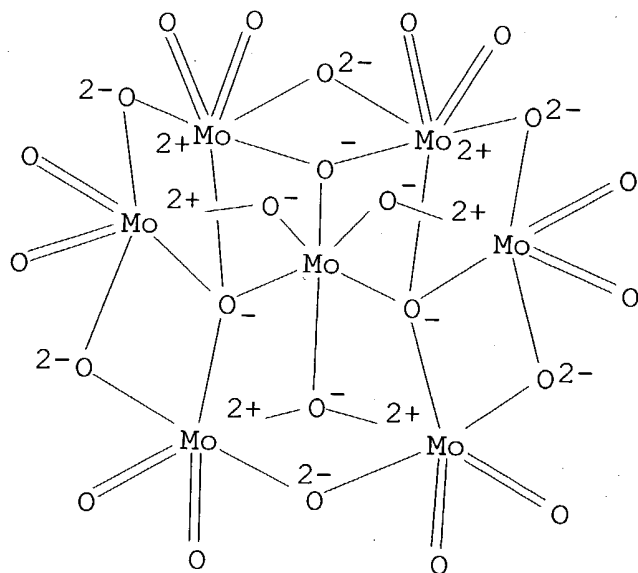
127:295907 Comparison of dry and solvent-mediated liquefaction of high-sulfur Turkish coals. Artok, L.; Gozmen, B.; Avci, A.; Erbatur, N. G.; Erbatur, O. (Department Chemistry, Cukurova University, Adana, 01330, Turk.). DGMK Tagungsbericht, 9704(Proceedings ICCS '97, Volume 3), 1493-1496 (English) 1997. CODEN: DGTA7. ISSN: 1433-9013. Publisher: Deutsche Wissenschaftliche Gesellschaft fuer Erdoel, Erdgas und Kohle.

AB Two high-S Turkish coals (Gediz 11.1% daf; Cayirhan 7.5% daf) were liquefied via catalytic and noncatalytic reactions in microautoclave tubing bombs at 300-450.degree., under 1000 psi H2 for 30 min., in the presence and absence of the H-donor solvent tetralin. (NH4)6Mo7O24 was utilized as the catalyst precursor in the catalytic runs. In terms of total conversion to THF-solubles and oil and gas formation, optimum conditions were found to be 450.degree. in the presence of tetralin. Indeed, the presence of tetralin promoted higher total conversions and oil formation at all temps. However, both coals demonstrated their highest overall conversion at 400.degree. in the absence of solvent; 90% for Gediz coal and 75% for Cayirhan, although the product slate shined to higher mol.-wt. products in this case. Conversion of S to **H2S** increased with temp.; approx. half the S content of both coals converted to **H2S** at 450.degree.. However tetralin was found to retard **H2S** formation; the amt. of **H2S** formed was ca 1/3-1/2 of that without solvent. Primary S structures detd. in the oil fraction were dibenzothiophene and various alkyl-substituted benzothiophenes. Catalyst was slightly effective in removing S in the absence of solvent, but only a negligible effect was obsd. in the presence of tetralin.

IT 12027-67-7, Ammonium heptamolybdate
(catalyst precursor; comparison of dry and solvent-mediated catalytic and noncatalytic liquefaction of high-S Turkish coals)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)

● 6 NH₄⁺

IT 7704-34-9, Sulfur, analysis
 (content in products after dry and solvent-mediated catalytic and
 noncatalytic liquefaction of high-S Turkish coals)
 RN 7704-34-9 HCA
 CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
 IT 12027-67-7, Ammonium heptamolybdate
 (catalyst precursor; comparison of dry and solvent-mediated
 catalytic and noncatalytic liquefaction of high-S Turkish coals)
 IT 7704-34-9, Sulfur, analysis
 (content in products after dry and solvent-mediated catalytic and
 noncatalytic liquefaction of high-S Turkish coals)

L26 ANSWER 6 OF 16 HCA COPYRIGHT 2004 ACS on STN
 120:275194 Fuel composition for two-cycle engines. Callis, Glenn E.;
 Sabourin, Edward T. (Chevron Research and Technology Co., USA). PCT
 Int. Appl. WO 9406897 A1 19940331, 34 pp. DESIGNATED STATES: W:

AU, CA, JP; RW: AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (English). CODEN: PIXXD2. APPLICATION: WO 1993-US8471 19930909. PRIORITY: US 1992-943844 19920911.

AB A fuel compn. for two-cycle engines comprising a major amt. of fuel boiling in the gasoline range and a minor amt. of a lubricant compn. comprising a base oil of lubricating viscosity and an additive formulation comprising (1) a molybdenum/sulfur complex of a basic nitrogen compd., (2) a carboxylic acid amide, and (3) a succinimide.

IT **7704-34-9D**, Sulfur, molybdenum salt complexes with **7783-06-4D, Hydrogen sulfide**, molybdenum salt complexes with (gasoline additives contg.)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

RN 7783-06-4 HCA

CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

IC ICM C10M159-18

ICS C10M133-16; C10M149-00

CC 51-7 (Fossil Fuels, Derivatives, and Related Products)

IT 62-55-5D, Thioacetamide, molybdenum salt complexes with 62-56-6D, Thiourea, molybdenum salt complexes with 1314-80-3D, Phosphorus pentasulfide, molybdenum salt complexes with 7439-98-7D, Molybdenum, basic nitrogen compd. salts, sulfur complexes with **7704-34-9D**, Sulfur, molybdenum salt complexes with 7782-91-4D, Molybdic acid, sulfur compd. complexes with **7783-06-4D, Hydrogen sulfide**, molybdenum salt complexes with 11098-84-3D, **Ammonium molybdate**, sulfur compd. complexes with (gasoline additives contg.)

L26 ANSWER 7 OF 16 HCA COPYRIGHT 2004 ACS on STN

118:106141 Catalysts for removal of sulfur-containing compounds from fuel gases such as natural gas and their manufacture and use.

Immel, Otto; Mueller, Harald (Bayer A.-G., Germany). Ger. Offen. DE 4104202 A1 19920813, 7 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1991-4104202 19910212.

AB Thiols, COS, CS₂, and other org. S-contg. compds. are removed from fuel gases such as natural gas by catalytic conversion with catalysts comprising an inorg., refractory monolithic honeycomb support loaded with .gtoreq.1 oxides of Group I, II, VI, and VIII

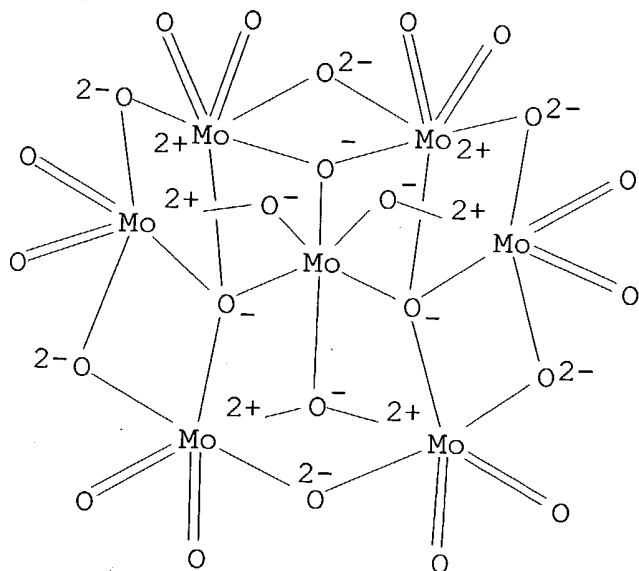
elements. Suitable supports include alumina, spinel, zeolites, and mica. Suitable catalysts contain .gtoreq.1 oxides of Cu, Zn, Cr, Mo, W, Fe, Co, and Ni.

IT 12027-67-7

(catalyst, for sweetening of natural gas)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

IT 7704-34-9D, Sulfur, org. compds. 7783-06-4D,
Hydrogen sulfide (H_2S), **Hydrogen**
sulfide, miscellaneous
 (removal of, from natural gas, catalyst for)
 RN 7704-34-9 HCA
 CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

RN 7783-06-4 HCA
 CN Hydrogen sulfide (H_2S) (8CI, 9CI) (CA INDEX NAME)

H_2S

- IC ICM B01J023-85
ICS B01J023-88; B01J023-94; B01D053-36; C01B031-20; C01B021-04;
C10K001-34
- ICA B01J021-04; B01J029-04; C10L003-00
- CC 51-5 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 49, 59
- IT 1313-99-1, Nickel oxide, uses 1314-13-2, Zinc oxide, uses
1314-35-8, Tungsten oxide, uses 1332-37-2, Iron oxide; uses
1344-70-3, Copper oxide 7789-09-5 11098-99-0, Molybdenum oxide
11104-61-3, Cobalt oxide 11118-57-3, Chromium oxide
12027-67-7 15855-70-6, Ammonium tungstate
(catalyst, for sweetening of natural gas)
- IT 75-15-0, Carbon disulfide, miscellaneous 463-58-1, Carbonyl
sulfide 7704-34-9D, Sulfur, org. compds.
7783-06-4D, Hydrogen sulfide (
H₂S), Hydrogen sulfide, miscellaneous
(removal of, from natural gas, catalyst for)
- L26 ANSWER 8 OF 16 HCA COPYRIGHT 2004 ACS on STN
- 105:131353 Interactions between copper, molybdenum and sulfur in the
rumen of sheep. Gawthorne, J. M.; Allen, J. D.; Nader, C. J. (Sch.
Vet. Stud., Murdoch Univ., Murdoch, 6150, Australia). Trace Elem.
Man Anim. -- TEMA 5, Proc. Int. Symp., 5th, Meeting Date 1984,
346-51. Editor(s): Mills, C. F.; Bremner, I.; Chesters, J. K. CAB:
Farnham Royal, Slough, UK. (English) 1985. CODEN: 55DSAX.
- AB Expts. were conducted to help explain the interference by Mo and S
with Cu availability and the kinetics of S metab. in the rumen of
sheep. Addn. of molybdate to the rumen prior to the addn. of Na₂S
soln. significantly decreased S²⁻ absorption by the rumen, while at
the same time trithiomolybdate (TTM) was readily detd. In in vitro
expts., addn. of TTM had no effect on the distribution of Zn and Fe,
but increased the proportion of Cu and Mo in the strained solids
fraction of the rumen digesta at the expense of the bacterial and
supernatant fractions. In in vitro studies of the effects of Mo and
S compd. on acid soly. of Cu in sheep rumen contents it was found
that TTM and **ammonium molybdate** (AM) decreased
Cu soly., whereas S²⁻ itself was without effect. In in vivo expts.,
TTM and AM at dietary concns. equiv. to 5 ppm Mo or 25 ppm Mo
approx. halved the proportions of Cu in the bacterial and
supernatant fractions. More significantly, the compds. reduced the
proportion of acid-sol. Cu in all fractions. It is hypothesized
that inorg. Mo compds., are converted to thiomolybdates in the rumen
in the presence of S²⁻. These compds., in turn, react to form
complexes that bind Cu and reduce its soly. and decrease H₂S
concn. and thus the rate of S²⁻ absorption.
- IT 7704-34-9, biological studies
(copper and molybdenum interaction with, in sheep rumen)
- RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 13-6 (Mammalian Biochemistry)

IT 7704-34-9, biological studies
(copper and molybdenum interaction with, in sheep rumen)

L26 ANSWER 9 OF 16 HCA COPYRIGHT 2004 ACS on STN

105:63474 Coal hydrogenation in the presence of an emulsified catalyst and a recycle paste-forming agent. Zekel, L. A.; Krichko, A. A.; Shpirt, M. Ya.; Yulin, M. K.; Pchelina, D. P.; Krasnobaeva, N. V. (Inst. Goryuch. Iskop., Moscow, USSR). Khimiya Tverdogo Topliva (Moscow, Russian Federation) (3), 73-6 (Russian) 1986. CODEN: KTVTBY. ISSN: 0023-1177.

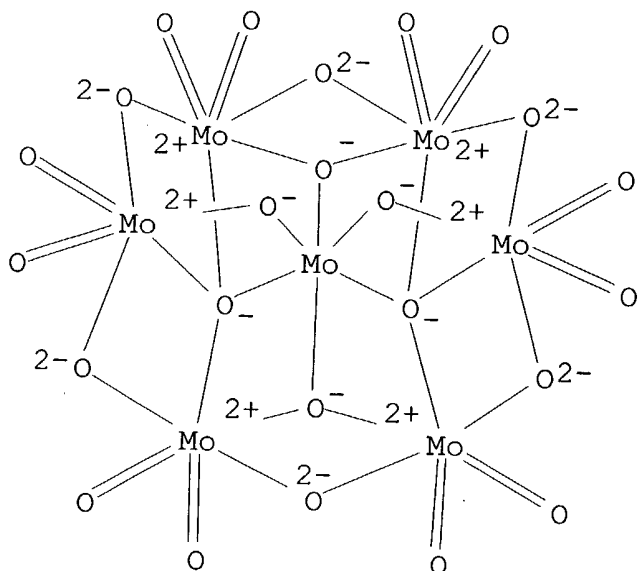
AB The consumption of Mo in the hydroliquefaction of coal catalyzed by an ammonium paramolybdate (I) suspension is lowered when powd. S is added. In a continuous process when a paste contg. I, S, coal, water, and petroleum distn. residues b. >280.degree. or coal liq. b. 300-400.degree., the fine particles of MoS₂ accumulate on the recycle paste. These MoS₂ particles have practically the same catalytic effect as I. Powd S that has not reacted with I is converted to H₂S as is also most of the coal S.

IT 12027-67-7

(catalysts, for coal hydroliquefaction, sulfur effect on)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

IT 7704-34-9, reactions
 (reactions of, with ammonium paramolybdate catalysts, in coal
 hydroliquefaction)
 RN 7704-34-9 HCA
 CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
 IT 12027-67-7
 (catalysts, for coal hydroliquefaction, sulfur effect on)
 IT 7704-34-9, reactions
 (reactions of, with ammonium paramolybdate catalysts, in coal
 hydroliquefaction)

L26 ANSWER 10 OF 16 HCA COPYRIGHT 2004 ACS on STN
 103:205053 Spectrophotometric determination of sulfur after reduction to
hydrogen sulfide in beryllium-containing minerals.
 Bogdanova, V. I.; Koz'menko, O. A.; Gorchakova, L. A. (USSR).
 Fiz.-Khim. Issled. Sul'fidnykh Silik. Sist., 155-66. Editor(s):
 Kolonin, G. R. Akad. Nauk SSSR, Sib. Otd., Inst. Geol. Geofiz.:
 Novosibirsk, USSR. (Russian) 1984. CODEN: 54KEAJ.

AB S was detd. in small samples of Be-contg. silicate minerals by methods involving redn. to **H2S**, reaction with **ammonium molybdate**, and measuring the absorbance of molybdenum blue.

IT 7704-34-9, analysis
(detn. of, in beryllium-contg. minerals, spectrophotometric)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 79-6 (Inorganic Analytical Chemistry)

IT 7704-34-9, analysis
(detn. of, in beryllium-contg. minerals, spectrophotometric)

L26 ANSWER 11 OF 16 HCA COPYRIGHT 2004 ACS on STN

102:48376 Multifunctional additive based on diethylenetriamine alkenylsuccinimide. Evstaf'ev, V. P.; Shor, G. I.; Ivanova, E. A.; Melamed, S. O. (VNII NP, USSR). Khimiya i Tekhnologiya Topliv i Masel (10), 25-8 (Russian) 1984. CODEN: KTPMAG. ISSN: 0023-1169.

AB A series of multifunctional (antiwear-antioxidants) lubricating oil additives were prepd. by chem. modifying S 5A (com. additive, alkenyl-2-[[[(2-aminoethyl)amino]ethyl]succinimide). Thus, Tomol 8 and Tomol A were prepd. from S 5A and compds. of S and P; Tomol D was the product of **H2S** with S 5A; Tomol V V was prepd. from org. S compds. and S 5A; Tomol S was prepd. from S and S 5A; SDMO was prepd. by a reaction of **ammonium molybdate** and S 5A.

IT 7704-34-9D, reaction products with alkenyl-2-[[[(2-aminoethyl)amino]ethyl]succinimide 7783-06-4D, reaction products with alkenyl-2-[[[(2-aminoethyl)amino]ethyl]succinimide (lubricating oil anticorrosion-antiwear additives)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

RN 7783-06-4 HCA

CN Hydrogen sulfide (H2S) (8CI, 9CI) (CA INDEX NAME)

H2S

CC 51-8 (Fossil Fuels, Derivatives, and Related Products)

IT 122-11-2 7704-34-9D, reaction products with alkenyl-2-[[[(2-aminoethyl)amino]ethyl]succinimide 7783-06-4D

, reaction products with alkenyl-2-[[(2-aminoethyl)amino]ethyl]succinimide 11098-84-3D, reaction products with alkenyl-2-[[(2-aminoethyl)amino]ethyl]succinimide 55644-48-9D, derivs. 59890-40-3D, derivs. 87917-08-6 94035-40-2 94189-45-4 94189-46-5 94189-47-6 94189-48-7 (lubricating oil anticorrosion-antiwear additives)

L26 ANSWER 12 OF 16 HCA COPYRIGHT 2004 ACS on STN

85:182910 Hydrodesulfurization catalyst. (American Cyanamid Co., USA; American Cyanamid Co.). Neth. Appl. NL 7510059 19760326, 13 pp. (Dutch). CODEN: NAXXAN. APPLICATION: NL 1975-10059 19750826.

AB A hydrodesulfurization catalyst, to remove high concns. of S from foreign oils, is prepd. Thus, 270 g calcined .gamma.-Al₂O₃ cylinders of 0.16 cm diam. and 0.8 cm³/g vol. are impregnated with 200 ml H₂O contg. 56.25 g (NH₄)₂Mo₂O₇ and 22 ml concd. NH₄OH. After drying for 30 min. at room temp. and 3 hr at 130.degree., it is calcined for 1 hr at 650.degree.. The material is then treated for 2 hr at 400.degree. with a gas mixt. contg. 10% H₂S and 90% H₂ to convert all MoO₃ to MoS₂. Part of the catalyst is then treated with a soln. of Co(SCN)₂ in CH₃CN, dried for 20 min at room temp., and dried 5 hr at 135.degree. under 0.5-1 mm pressure. This modified catalyst contains the equiv. of 3% CoO and 15% MoO and after presulfurizing had a relative S activity of 180 vs. 100 for catalyst not sulfided before addn. of Co.

IT 27546-07-2

(catalyst manuf. from, for hydrodesulfurization of petroleum)

RN 27546-07-2 HCA

CN Ammonium molybdenum oxide ((NH₄)₂Mo₂O₇) (9CI) (CA INDEX NAME)

Component	Ratio	Component Registry Number
O	7	17778-80-2
H4N	2	14798-03-9
Mo	2	7439-98-7

IT 7704-34-9, uses and miscellaneous

(removal of, from petroleum, catalysts for)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

IC B01J037-20

CC 67-1 (Catalysis and Reaction Kinetics)

Section cross-reference(s): 51

IT 71-48-7 3017-60-5 27546-07-2

(catalyst manuf. from, for hydrodesulfurization of petroleum)
IT 7704-34-9, uses and miscellaneous
(removal of, from petroleum, catalysts for)

L26 ANSWER 13 OF 16 HCA COPYRIGHT 2004 ACS on STN
83:38342 Sulfide measurement using **ammonium molybdate**

. Darcel, F. C.; Ali, M. S. (Sediment Biomater. Lab., Minist.
Environ., Toronto, ON, Can.). Proc. Int. Conf. Transp. Persistent
Chem. Aquat. Ecosyst., II, 7-12. Natl. Res. Counc. Can: Ottawa,
Can. (English) 1974. CODEN: 30IAAH.

AB A technique utilizing **ammonium molybdate**
[11098-84-3] in a microabsorber system able to analyze 0.5-1000
.mu.g sulfide [18496-25-8] as H₂S [7783-06-4] in natural waters and industrial wastes, showed
detection limits of 0.02 ppm, and 0.002 ppm after increasing aliquot
sizes. H₂S evolved from thioacetamide [62-55-5] was
detected at .gtoreq. 0.2 ppm.

IT 7783-06-4, analysis 18496-25-8
(detn. of, in water, by **ammonium molybdate**)

RN 7783-06-4 HCA

CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

RN 18496-25-8 HCA

CN Sulfide (8CI, 9CI) (CA INDEX NAME)

S₂-

CC 4-1 (Toxicology)

Section cross-reference(s): 60

ST sulfide detn **ammonium molybdate**; waste water
sulfide detn

IT Waste water

(sulfide detn. in, by **ammonium molybdate**)

IT 62-55-5

(detn. of, by **ammonium molybdate**)

IT 7783-06-4, analysis 18496-25-8

(detn. of, in water, by **ammonium molybdate**)

IT 7732-18-5, analysis

(sulfide detn. in, by **ammonium molybdate**)

L26 ANSWER 14 OF 16 HCA COPYRIGHT 2004 ACS on STN

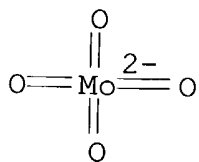
65:107083 Original Reference No. 65:19906b-d Drilling mud additive.
Annis, Max R. (Esso Production Research Co.). US 3275551 19660927, 8
pp. (Unavailable). APPLICATION: US 19621227.

AB Drilling mud additive having properties which inhibit the sticking of drill pipe and collars is described. The additive is a Mo complex prepd. by dispersing an ext. of a Mo compd. in an oil soln. of a surface-active material and converting a portion of the Mo compd. to the sulfide. For example, the Mo complexes are prepd. as follows. $(\text{NH}_4)_2\text{MoO}_4$ (1 part by wt.) is mixed with 6 parts of 6N HCl. The soln. is cooled to 50-80.degree.F. and extd. with, e.g., 21.5 parts Et₂O or 10 parts MeCOEt. Sepn. into 2 layers is permitted and the ext. layer is removed and stirred into 5 to 8 parts by wt. of a surfactant. The dispersion is then treated with **H₂S** (S/Mo 1:1). The dispersion is heated and stripped with an inert gas, e.g., N, to remove solvent H₂O, and excess **H₂S** and the product is filtered. The additive was field tested in a well while drilling from approx. 12,500 to 13,500 ft. Additive (25 gal.) was added to a mud composed of a 12.6 lb./gal. gyp-Q-Broxin mud contg. 8% kerosine and 24% solids, and having a funnel viscosity of 50 sec. and an API filtration of 5.2 ml. The sticking coeff. (measure of how strongly pipe becomes stuck and is the tangential force required to move a plate over the mud filter cake divided by the force normal to the plate) showed a decrease of 10% in the 60-min. set time value.

IT **7704-34-9, Sulfur**
 (compounds, phosphorus-contg., as dispersants for, Mo sulfide drilling fluid additive)
 RN 7704-34-9 HCA
 CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

IT **13106-76-8, Ammonium molybdate(VI),**
 $(\text{NH}_4)_2\text{MoO}_4$
 (drilling fluid additive from HCl- and **H₂S**-treated)
 RN 13106-76-8 HCA
 CN Molybdate (MoO_4^{2-}), diammonium, (T-4)- (9CI) (CA INDEX NAME)

● 2 NH_4^+

IT 7783-06-4, Hydrogen sulfide (H₂S)
)
 (drilling fluid additives from Mo compds. treated with)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

NCL 252008500
 CC 27 (Petroleum and Petroleum Derivatives)
 IT Drilling fluids or Drilling muds
 (molybdenum compds. (H₂S-treated) for)
 IT 7647-01-0, Hydrochloric acid
 (ammonium molybdate treated with, as drilling
 fluid additive)
 IT 7439-98-7, Molybdenum
 (compds., drilling fluid additives from H₂S-treated)
 IT 7704-34-9, Sulfur
 (compounds, phosphorus-contg., as dispersants for, Mo sulfide
 drilling fluid additive)
 IT 13106-76-8, Ammonium molybdate(VI),
 (NH₄)₂MoO₄
 (drilling fluid additive from HCl- and H₂S-treated)
 IT 7782-91-4, Molybdic(VI) acid
 (drilling fluid additive from H₂S-treated)
 IT 11116-47-5, Molybdate(VI)
 (drilling fluid additives from H₂S-treated)
 IT 7783-06-4, Hydrogen sulfide (H₂S)
)
 (drilling fluid additives from Mo compds. treated with)

L26 ANSWER 15 OF 16 HCA COPYRIGHT 2004 ACS on STN
 51:24835 Original Reference No. 51:4876b-d Influence of arsenic on the
 analysis of iron and steel. I. Determination of sulfur and
 phosphorus in iron and steel. Goto, Hidehiro; Watanabe, Shiro Sci.
 Repts. Research Insts., Tohoku Univ., Ser. A, 8, 157-65
 (Unavailable) 1956.
 AB The effects of As on the detns. of S and P in iron and steel were
 studied and a method for avoiding the interference of As is
 described. S in iron and steel was detd. volumetrically by ignition
 to SO₂ and SO₃, by solution in nonoxidative strong acids to form
 H₂S which is then detd. volumetrically by I₂, and
 gravimetrically by pptn. as BaSO₄. In each of these 3 methods the
 presence of As has no effect on the accuracy of the S detn. It is
 suggested that an efficient absorbing bottle of KMnO₄ soln. be used
 in the 2nd method to reduce the health hazard from AsH₃. P is detd.
 by standard methods by alkalimetric titration after ammonium

molybdate pptn. Arsenic interferes by forming a yellow ppt. of ammonium arsenomolybdate and is usually removed as a sulfide or bromide. The authors present data which show that the effect of As on P can be removed by pptn. at lower temps. (30-40.degree.).

IT 7704-34-9, Sulfur
(analysis, detn. in Fe and steel, As effect on)
RN 7704-34-9 HCA
CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 7 (Analytical Chemistry)
IT 7704-34-9, Sulfur 7723-14-0, Phosphorus
(analysis, detn. in Fe and steel, As effect on)

L26 ANSWER 16 OF 16 HCA COPYRIGHT 2004 ACS on STN
36:23836 Original Reference No. 36:3655c-d A rapid method for the determination of sulfur in fuels by reduction. Mantel, W.; Schreiber, W. Archiv fuer Waermewirtschaft und Dampfkesselwesen, 21, 65-7 From: Chem. Zentr. 1940, I, 3213 (Unavailable) 1940. CODEN: AWDKAV. ISSN: 0365-8422.

AB cf. C. A. 34, 4540.6, 7571.8; 35, 7684.5. Coals were gasified in the presence of a catalyst consisting of a mixt. of CaC_2O_4 , $\text{Ca}(\text{OH})_2$ and **ammonium molybdate**. For coke and low-temp. coke Li_2CO_3 had to be added also to this mixt. All of the S was evolved as **H₂S**, which was pptd. in the usual manner as CdS and detd. indometrically. Comparative results obtained on 34 samples are reported.

IT 7704-34-9, Sulfur
(analysis, detn. in fuels)
RN 7704-34-9 HCA
CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

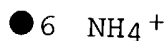
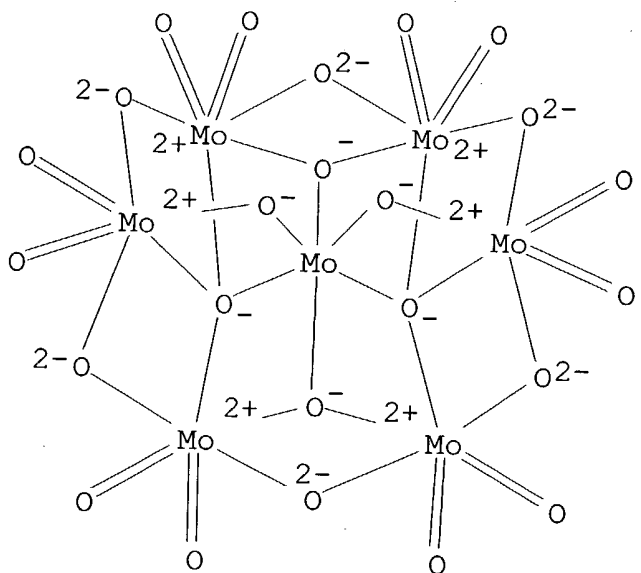
CC 21 (Fuels and Carbonization Products)
IT 7704-34-9, Sulfur
(analysis, detn. in fuels)

=> d 127 1-20 cbib abs hitstr hitind

L27 ANSWER 1 OF 20 HCA COPYRIGHT 2004 ACS on STN
141:252910 Synthesis, Characterization, and X-Ray Diffraction Analysis of Triethylenetetraammonium Tetrathiomolybdate. Pokhrel, S.; Nagaraja, K. S.; Varghese, B. (Loel Institute of Energy, Chemistry

Department, Loel College, Chennai, India). Journal of Structural Chemistry (Translation of Zhurnal Strukturnoi Khimii), 44(4), 689-694 (English) 2003. CODEN: JSTCAM. ISSN: 0022-4766. Publisher: Kluwer Academic/Consultants Bureau.

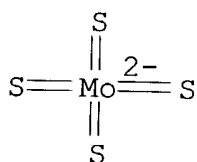
- AB The reaction of gaseous **H₂S** with aq. ammonium heptamolybdate in the presence of triethylenetetramine (trien) gave a red complex. The complex was recrystd. in hot H₂O and characterized by element anal. and UV, visible, IR, and ¹H NMR spectroscopy. PMR revealed accidental magnetic equivalence, resulting from the proximity of [MoS₄]²⁻ species in one complex mol. to the open triethylenetetramine ligand of another mol. (TrienH₂)[MoS₄] crystallizes in the orthorhombic crystal system, space group Pca2₁, a 13.045(2), b 16.461(3), c 13.754(2) .ANG., .alpha. 90, .beta. 90, .gamma. 90.degree., Z = 8, R₁ = 0.0323, wR₂ = 0.0730. The structure consists of the tetrahedral tetrathiomolybdate anions, forming an extended 3-dimensional framework in solids due to the interactions with triene cations via Mo-S...H-N H bonds.
- IT 12027-67-7, Ammonium heptamolybdate
(for prepn. of triethylenetetraammonium tetrathiomolybdate)
- RN 12027-67-7 HCA
- CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



(prepn. and crystal structure of)
 RN 749859-39-0 HCA
 CN INDEX NAME NOT YET ASSIGNED

CM 1

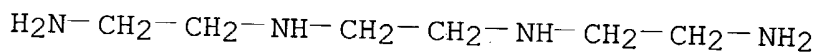
CRN 13818-85-4
 CMF H . 1/2 Mo S4
 CCI CCS



● 2 H⁺

CM 2

CRN 112-24-3
 CMF C6 H18 N4



CC 78-7 (Inorganic Chemicals and Reactions)
 Section cross-reference(s): 75
 IT 112-24-3, Triethylenetetramine 12027-67-7, Ammonium
 heptamolybdate
 (for prepn. of triethylenetetraammonium tetrathiomolybdate)
 IT 749859-39-0P
 (prepn. and crystal structure of)

L27 ANSWER 2 OF 20 HCA COPYRIGHT 2004 ACS on STN
 140:227820 Preparation, characterization, and x-ray structure analysis
 of diethylenetriammonium tetrathiomolybdate. Pokhrel, Suman;
 Nagaraja, K. S.; Varghese, Babu (Department of Chemistry, Loyola
 Institute of Frontier Energy, Loyola College, Chennai, 600 034,
 India). Journal of Chemical Crystallography, 33(11), 903-908
 (English) 2003. CODEN: JCCYEV. ISSN: 1074-1542. Publisher: Kluwer
 Academic/Plenum Publishers.
 AB The interaction of H₂S gas with aq. ammonium
 heptamolybdate soln. in the presence of diethylenetriamine (dien)

gave diethylenetriammonium tetrathiomolybdate crystals. The elemental analyses, UV-Visible, IR, and ^1H NMR spectra suggested org. cation and $(\text{MoS}_4)^{2-}$ moiety. The ^1H NMR revealed two sets of sym. A2X2 multiple patterns. The compd. crystallizes in monoclinic space group Pn, a 7.196(6), b 7.532(3), c 11.525(10) .ANG., .beta. 90.17(3), and Z = 2, Rw1 = 0.0261 and Rw2 = 0.0698. The structure consists of tetrahedral tetrathiomolybdate anions, which form an extended three-dimensional network in the solid state with Mo-S.cntdot..cntdot..cntdot.H-N H bonding with the org. cation.

IT 663949-90-4P

(prepn. and crystal structure of)

RN 663949-90-4 HCA

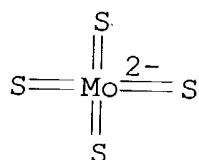
CN Molybdate(2-), tetrathioxo-, (T-4)-, dihydrogen, compd. with N-(2-aminoethyl)-1,2-ethanediamine (1:1) (9CI) (CA INDEX NAME)

CM 1

CRN 13818-85-4

CMF H . 1/2 Mo S4

CCI CCS

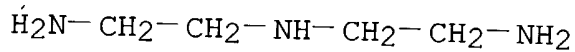


● 2 H^+

CM 2

CRN 111-40-0

CMF C4 H13 N3



IT 7783-06-4, Hydrogen sulfide, reactions

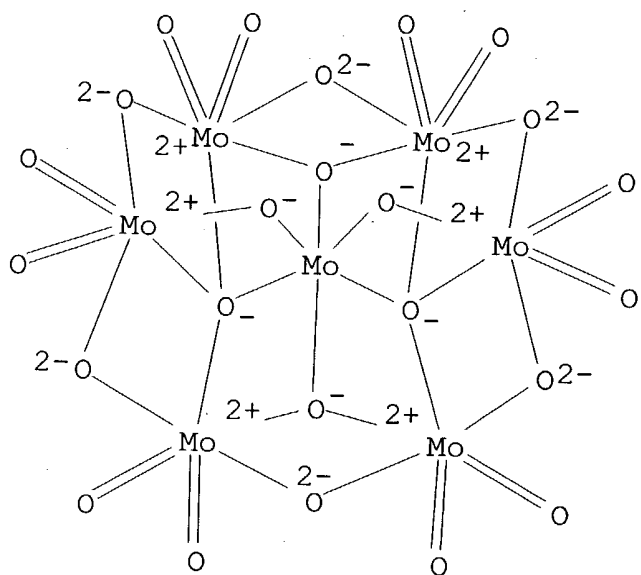
(reaction with ammonium heptamolybdate and diethylenetriamine)

RN 7783-06-4 HCA

CN Hydrogen sulfide (H_2S) (8CI, 9CI) (CA INDEX NAME)

H_2S

- IT 12027-67-7, Ammonium heptamolybdate
(reaction with **hydrogen sulfide** and
diethylenetriamine)
RN 12027-67-7 HCA
CN Molybdate (Mo7O246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH₄⁺

- CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
IT 663949-90-4P
(prepn. and crystal structure of)
IT 7783-06-4, **Hydrogen sulfide**, reactions
(reaction with ammonium heptamolybdate and diethylenetriamine)
IT 111-40-0, Diethylenetriamine
(reaction with **hydrogen sulfide** and ammonium
heptamolybdate)
IT 12027-67-7, Ammonium heptamolybdate
(reaction with **hydrogen sulfide** and
diethylenetriamine)
L27 ANSWER 3 OF 20 HCA COPYRIGHT 2004 ACS on STN
135:326548 Two Cation Disulfide Layers in the W_xMo_(1-x)S₂ Lamellar Solid
Solution. Thomazeau, Cecile; Geantet, Christophe; Lacroix, Michel;
Harle, Virginie; Benazeth, Simone; Marhic, Christiane; Danot, Michel

(Institut de Recherches sur la Catalyse, UPR CNRS 5401, Villeurbanne, 69626, Fr.). Journal of Solid State Chemistry, 160(1), 147-155 (English) 2001. CODEN: JSSCBI. ISSN: 0022-4596. Publisher: Academic Press.

AB WxMo(1-x)S_2 compds. with both Mo and W present in every disulfide layer, i.e., as an intralayer solid soln., can be obtained. Several synthesis routes were used but all of them do not allow this solid soln. and this evidences the decisive role of the nature of the precursor. In no case was formation of a WxMo(1-x)S_2 solid soln. obsd. which resulted from stacking of homocationic $[\text{WS}_2]$ and $[\text{MoS}_2]$ layers (interlayer solid soln.). (c) 2001 Academic Press.

IT 7783-06-4, **Hydrogen sulfide (H_2S)**, reactions 12027-67-7, Ammonium heptamolybdate (for prepn. of layered molybdenum tungsten disulfide solid solns.)

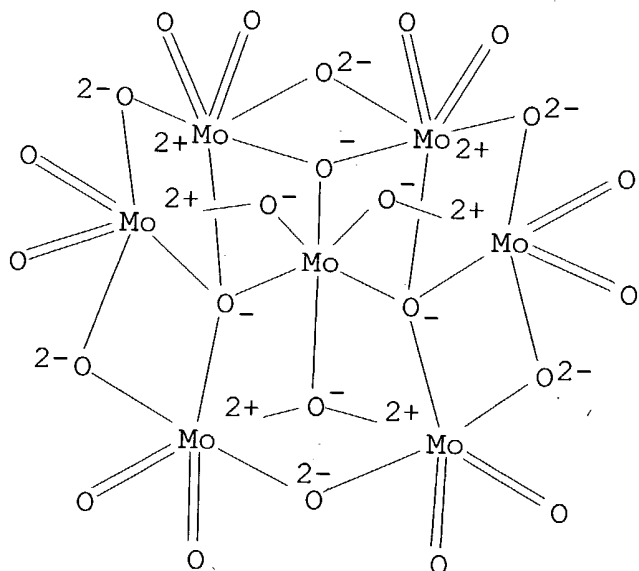
RN 7783-06-4 HCA

CN Hydrogen sulfide (H_2S) (8CI, 9CI) (CA INDEX NAME)

H_2S

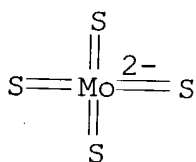
RN 12027-67-7 HCA

CN Molybdate ($\text{Mo}_7\text{O}_{24}^{6-}$), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

IT 15060-55-6P
 (for prepn. of layered molybdenum tungsten disulfide solid
 solns.)
 RN 15060-55-6 HCA
 CN Molybdate(2-), tetrathioxo-, diammonium, (T-4)- (9CI) (CA INDEX
 NAME)



●2 NH₄⁺

CC 78-6 (Inorganic Chemicals and Reactions)
 IT 7783-06-4, **Hydrogen sulfide** (H₂S)
), reactions 12027-67-7, Ammonium heptamolybdate
 12135-76-1, Ammonium sulfide 13862-78-7
 (for prepn. of layered molybdenum tungsten disulfide solid
 solns.)
 IT 15060-55-6P
 (for prepn. of layered molybdenum tungsten disulfide solid
 solns.)

L27 ANSWER 4 OF 20 HCA COPYRIGHT 2004 ACS on STN
 135:204437 Synthesis and x-ray structure characterization of
 ethylenediammonium tetrathiomolybdate. Srinivasan, B. R.; Vernekar,
 Beena K.; Nagarajan, K. (Department of Chemistry, Goa University,
 Goa, 403 206, India). Indian Journal of Chemistry, Section A:
 Inorganic, Bio-inorganic, Physical, Theoretical & Analytical
 Chemistry, 40A(6), 563-567 (English) 2001. CODEN: ICACEC. ISSN:
 0376-4710. OTHER SOURCES: CASREACT 135:204437. Publisher: National
 Institute of Science Communication, CSIR.

AB The passage of **hydrogen sulfide** gas into an aq.
 ammonium heptamolybdate soln. in the presence of ethylenediamine
 gives stable ethylenediammonium tetrathiomolybdate in good yields.
 The title compd. was characterized by IR, UV-visible and elemental
 anal. and its structure was detd. by single crystal x-ray
 crystallog. Ethylenediammonium tetrathiomolybdate crystallizes in
 the orthorhombic space group P212121 with the following unit cell
 dimensions for C₂H₁₀N₂S₄Mo (M = 286.3) a 8.582(5), b 9.276(5), c
 11.792(5) .ANG., .alpha. = .beta. = .gamma. 90..degree., .nu. =
 938.7(8) .ANG.³, Z = 4, dc = 2.026 g cm⁻³. The structure of the

title compd. consists of tetrahedral tetrathiomolybdate anions, which form an extended three dimensional network in the solid state, with the aid of N-H...S as well as C-H...S hydrogen bonding interactions with the org. cation.

IT **60413-61-8P**, Ethylenediammonium tetrathiomolybdate
(prepn. and crystal and mol. structure)

RN 60413-61-8 HCA

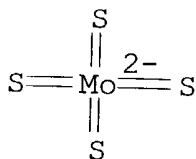
CN Molybdate(2-), tetrathioxo-, (T-4)-, dihydrogen, compd. with 1,2-ethanediamine (1:1) (9CI) (CA INDEX NAME)

CM 1

CRN 13818-85-4

CMF H . 1/2 Mo S4

CCI CCS

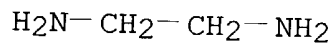


●2 H⁺

CM 2

CRN 107-15-3

CMF C2 H8 N2



IT **7783-06-4, Hydrogen sulfide**, reactions

12027-67-7, Ammonium heptamolybdate

(reactant for prepn. of ethylenediammonium tetrathiomolybdate)

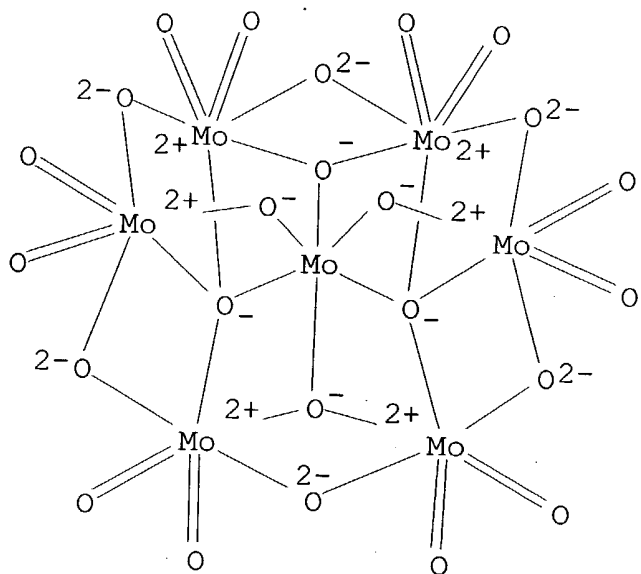
RN 7783-06-4 HCA

CN Hydrogen sulfide (H2S) (8CI, 9CI) (CA INDEX NAME)

H₂S

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)

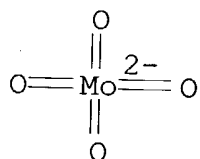


● 6 NH_4^+

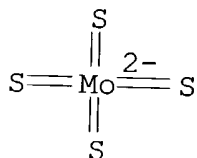
- CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
- IT 60413-61-8P, Ethylenediammonium tetrathiomolybdate
(prepn. and crystal and mol. structure)
- IT 7783-06-4, **Hydrogen sulfide**, reactions
12027-67-7, Ammonium heptamolybdate
(reactant for prepn. of ethylenediammonium tetrathiomolybdate)
- L27 ANSWER 5 OF 20 HCA COPYRIGHT 2004 ACS on STN
- 132:136942 One-pot conversion of alcohols to disulfides mediated by benzyltriethylammonium tetrathiomolybdate. Sinha, Surajit; Ilankumaran, P.; Chandrasekaran, S. (Department of Organic chemistry, Indian Institute of Science, Bangalore, 560 012, India). Tetrahedron, 55(51), 14769-14776 (English) 1999. CODEN: TETRAB. ISSN: 0040-4020. OTHER SOURCES: CASREACT 132:136942. Publisher: Elsevier Science Ltd..
- AB The 1-pot conversion of alcs. to disulfides is reported with good yields via the activation of a HO group with DCC or $\text{P}(\text{NMe}_2)_3/\text{CCl}_4$ followed by treatment with $(\text{PhCH}_2\text{NMe}_3)_2\text{MOS}_4$.
- IT 7783-06-4, **Hydrogen sulfide**, reactions
13106-76-8, Ammonium molybdate
(prepn. of benzylethylammonium thiomolybdate)
- RN 7783-06-4 HCA
- CN Hydrogen sulfide (H_2S) (8CI, 9CI) (CA INDEX NAME)

H₂S

RN 13106-76-8 HCA
 CN Molybdate (MoO₄²⁻), diammonium, (T-4)- (9CI) (CA INDEX NAME)

●2 NH₄⁺

IT 15060-55-6P
 (prepn. of benzylethylammonium thiomolybdate)
 RN 15060-55-6 HCA
 CN Molybdate(2-), tetrathio-, diammonium, (T-4)- (9CI) (CA INDEX NAME)

●2 NH₄⁺

IT 146785-42-4P, Benzyltriethylammonium tetrathiomolybdate
 (prepn. of disulfides by reaction of alcs. with
 benzylethylammonium thiomolybdate)
 RN 146785-42-4 HCA
 CN Benzenemethanaminium, N,N,N-triethyl-, (T-4)-tetrathioxomolybdate(2-)
) (2:1) (9CI) (CA INDEX NAME)

CM 1

CRN 16652-03-2
 CMF C13 H22 N

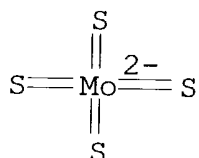
Et₃⁺N-CH₂-Ph.

CM 2

CRN 16330-92-0

CMF Mo S4

CCI CCS



CC 21-2 (General Organic Chemistry)

Section cross-reference(s): 78

IT 7783-06-4, Hydrogen sulfide, reactions

13106-76-8, Ammonium molybdate

(prepn. of benzylethylammonium thiomolybdate)

IT 15060-55-6P

(prepn. of benzylethylammonium thiomolybdate)

IT 62965-15-5P 146785-42-4P, Benzyltriethylammonium tetrathiomolybdate

(prepn. of disulfides by reaction of alcs. with benzylethylammonium thiomolybdate)

L27 ANSWER 6 OF 20 HCA COPYRIGHT 2004 ACS on STN

128:284373 Conversion of oxo and thiomolybdates to active dispersed catalysts. Zhan, Xiaodong; Dieterle, Mike; Lucas, Anthony; Van Woert, Howard; Givens, Edwin N. (Center Applied Energy Res., Univ. Kentucky, Lexington, KY, 40511-8410, USA). Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry, 43(2), 320-324 (English) 1998. CODEN: PSADFZ. Publisher: American Chemical Society, Division of Fuel Chemistry.

AB Oxomolybdates impregnated on coal are excellent catalyst precursors in the liquefaction of Wyodak coal, esp. when sulfur is added during the reaction. The active catalysts are oxothiomolybdates. This paper discusses two approaches toward converting oxomolybdates into active catalyst and identifying the types of Mo-S Bonding that contribute toward their activity. In the first, several oxothiomolybdates having different forms of Mo-S bonds were prep'd. in our lab. and impregnated onto Wyodak coal. THF dissoln. and resid conversion for these precursors were det'd. both in the presence and absence of added H₂S. In the second

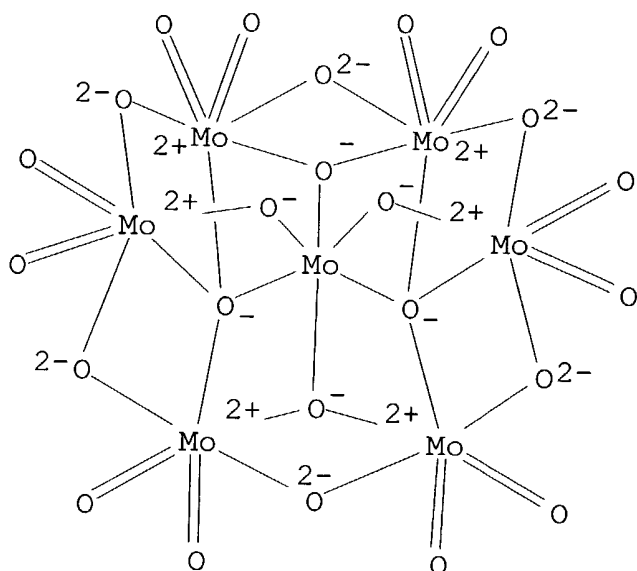
approach, ammonium heptamolybdate was treated in flowing **H₂S** in H₂ at temps. to permit slow conversion of the oxomolybdate into its active form. The effect of this pretreatment on the activities of these catalyst impregnated coals were detd.

IT 12027-67-7, Ammonium heptamolybdate 15060-55-6
16150-60-0

(conversion of oxo and thiomolybdates to active dispersed coal liquefaction catalysts)

RN 12027-67-7 HCA

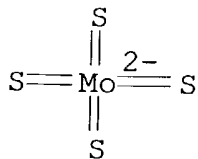
CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



●6 NH₄⁺

RN 15060-55-6 HCA

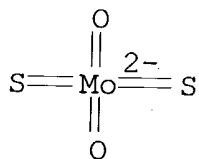
CN Molybdate(2-), tetrathioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

RN 16150-60-0 HCA

CN Molybdate(2-), dioxodithioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

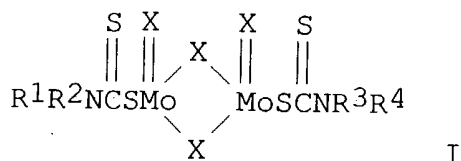
CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 67

IT 7439-98-7, Molybdenum, uses 12027-67-7, Ammonium
heptamolybdate 15060-55-6 16150-60-0
(conversion of oxo and thiomolybdates to active dispersed coal
liquefaction catalysts)

L27 ANSWER 7 OF 20 HCA COPYRIGHT 2004 ACS on STN

123:13509 A powdery molybdenum oxysulfide dithiocarbamate composition, a process for producing same, and a grease composition containing the composition.. Kamkura, Tamiji; Tanaka, Noriyoshi; Fukushima, Aritoshi; Tatsume, Yukio; Morita, Kazuhisa (Asahi Denka Kogyo K.K., Japan). Eur. Pat. Appl. EP 638582 A2 19950215, 15 pp. DESIGNATED STATES: R: BE, DE, ES, FR, GB, IT, LU, NL, SE. (English). CODEN: EPXXDW. APPLICATION: EP 1994-112498 19940810. PRIORITY: JP 1993-201498 19930813.

GI



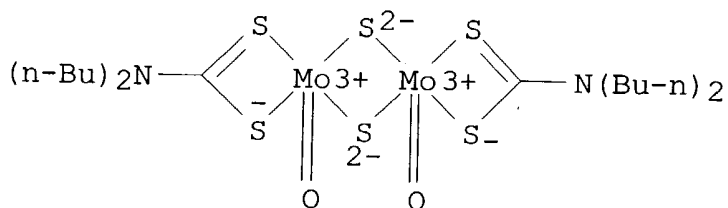
AB The powdery molybdenum oxysulfide dithiocarbamate compn. I, where R₁, R₂, R₃ and R₄ are independent hydrocarbyl groups and may be the same or different groups, and the total no. of carbon atoms contained in R₁ to R₄ is 4 to 36; and where X is sulfur or oxygen and the compn. of the total of all X's is given as SmO_n in which n and m satisfy the ranges of 1.7 .ltoreq. m .ltoreq. 3.5 and 0.5 .ltoreq. n .ltoreq. 2.3, resp., and in which the constituent particles have diams. of not larger than 50.mu.m, has low corrosive action and excellent lubricity. The compn. is prepd. by reacting a molybdenum trioxide or an alkali metal salt or an ammonium salt of molybdic acid with alkali **hydrogen sulfide** or alkali sulfide (molar ratio 1:(1-2)), carbon disulfide, a secondary amine, and a mineral acid. The compn. is suitable for use in greases.

IT 60428-79-7P 90901-24-9P 155962-51-9P
163894-30-2P

(molybdenum oxysulfide dithiocarbamate additive for lubricating greases)

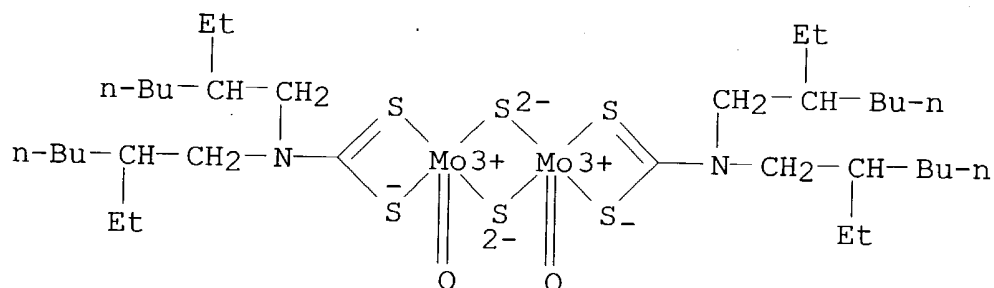
RN 60428-79-7 HCA

CN Molybdenum, bis(dibutylcarbamodithioato-.kappa.S;.kappa.S')dioxodi-.mu.-thioxodi-, stereoisomer (9CI) (CA INDEX NAME)



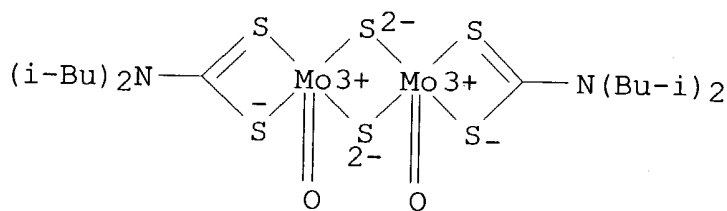
RN 90901-24-9 HCA

CN Molybdenum, bis[bis(2-ethylhexyl)carbamodithioato-.kappa.S;.kappa.S']dioxodi-.mu.-thioxodi- (9CI) (CA INDEX NAME)



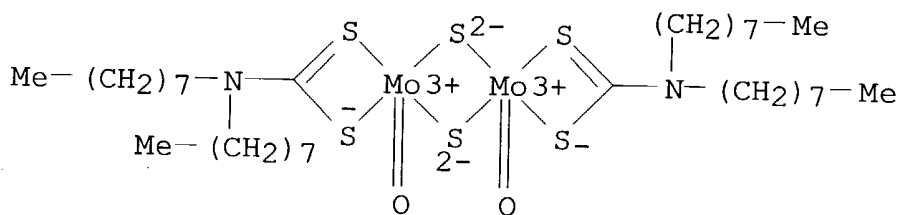
RN 155962-51-9 HCA

CN Molybdenum, bis[bis(2-methylpropyl)carbamodithioato-S,S']dioxodi-
.mu.-thioxodi- (9CI) (CA INDEX NAME)



RN 163894-30-2 HCA

CN Molybdenum, bis(dioctylcarbamodithioato-.kappa.S,.kappa.S')dioxodi-
.mu.-thioxodi- (9CI) (CA INDEX NAME)

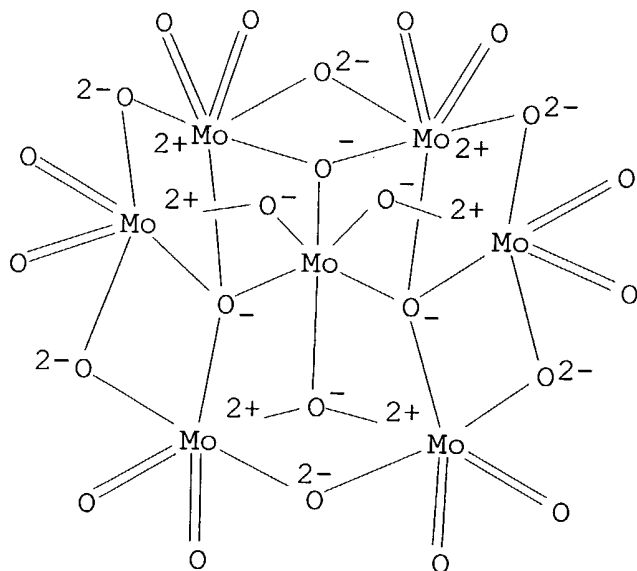


IT 12027-67-7, Ammonium molybdate

(molybdenum oxysulfide dithiocarbamate additive for lubricating greases)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

- IC ICM C07F011-00
ICS C10M163-00
- CC 51-8 (Fossil Fuels, Derivatives, and Related Products)
- IT 60428-79-7P 90901-24-9P 155962-51-9P
163894-30-2P
(molybdenum oxysulfide dithiocarbamate additive for lubricating greases)
- IT 64-17-5, Ethanol, reactions 67-56-1, Methanol, reactions
67-63-0, 2-Propanol, reactions 71-43-2, Benzene, reactions
75-15-0, Carbon disulfide, reactions 106-20-7,
Di-2-ethylhexylamine 108-88-3, Toluene, reactions 110-96-3,
Diisobutylamine 111-92-2, Dibutylamine 1120-48-5, Dioctyl amine
1310-61-8, Potassium **hydrogen sulfide**
1312-73-8, Potassium sulfide 1313-27-5, Molybdenum trioxide,
reactions 1313-82-2, Sodium sulfide, reactions 1330-20-7,
Xylene, reactions 7631-95-0, Sodium molybdate 7647-01-0,
Hydrochloric acid, reactions 7782-91-4D, Molybdic acid, alkali
metal or ammonium salt 12027-67-7, Ammonium molybdate
12135-76-1, Ammonium sulfide 13446-49-6, Potassium molybdate
16721-80-5, Sodium **hydrogen sulfide**
(molybdenum oxysulfide dithiocarbamate additive for lubricating greases)

L27 ANSWER 8 OF 20 HCA COPYRIGHT 2004 ACS on STN

119:19258 Preparation, structure and properties of dinuclear, trinuclear incomplete cuboidal and cuboidal molybdenum-selenium cluster complexes. Nasreldin, Mohamed; Henkel, Gerald; Kampmann, Gunnar; Krebs, Bernt; Lamprecht, Gert J.; Routledge, Carol A.; Sykes, A. Geoffrey (Dep. Chem., Univ. Newcastle upon Tyne, NE1 7RU, UK). Journal of the Chemical Society, Dalton Transactions: Inorganic Chemistry (1972-1999) (5), 737-46 (English) 1993. CODEN: JC DTBI. ISSN: 0300-9246.

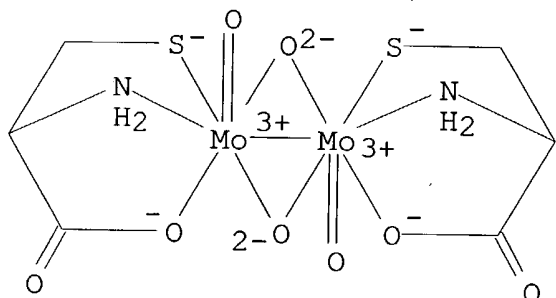
AB Prepn. of $[\text{MoV}_2\text{O}_2(\mu\text{-Se})_2(\text{cys})_2]^{2-}$ (cysH = L-cysteine) and the related $[\text{Mo}_2\text{O}_2(\mu\text{-Se})_2(\text{H}_2\text{O})_6]^{2+}$ enabled the trimolybdenum(IV) incomplete cuboidal $\text{Mo}_3\text{O}_x\text{Se}_4\text{-x}^{4+}$ ($x = 0\text{-}3$) complexes $[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-Se})_3(\text{H}_2\text{O})_9]^{4+}$, $[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-O})(\mu\text{-Se})_2(\text{H}_2\text{O})_9]^{4+}$, $[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-O})_2(\mu\text{-Se})(\text{H}_2\text{O})_9]^{4+}$, $[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-O})_3(\text{H}_2\text{O})_9]^{4+}$ and the mixed-valence (av. oxidn. state 3.25) cuboidal $[\text{Mo}_4(\mu\text{-}3\text{-Se})_4(\text{H}_2\text{O})_{12}]^{5+}$ complex to be obtained. The crystal structures of $\text{Na}[\text{NMe}_4][\text{Mo}_2\text{O}_2(\mu\text{-Se})_2(\text{cys})_2] \cdot 7\text{H}_2\text{O}$, $[\text{NMe}_4]_5[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-Se})_3(\text{NCS})_9]$, $[\text{NMe}_4]_5[\text{Mo}_3(\mu\text{-}3\text{-Se})(\mu\text{-O})_2(\mu\text{-Se})(\text{NCS})_9]$ and $[\text{Mo}_4\text{Se}_4(\text{H}_2\text{O})_{12}](\text{pts})_5 \cdot 14\text{H}_2\text{O}$ (pts- = toluene-p-sulfonate) were detd. Electrolytic redn. of $[\text{Mo}_4(\mu\text{-}3\text{-Se})_4(\text{H}_2\text{O})_{12}]^{5+}$ in 2M Hpts gives quant. air-sensitive $[\text{MoIII}_4(\mu\text{-}3\text{-Se})_4(\text{H}_2\text{O})_{12}]^{4+}$ (Ef.degree. = 190 mV). Similarly the 5+ ion can be oxidized to the 6+ state (Ef.degree. = 790 mV). Compared to analogous Mo-S clusters, Mo-Se clusters exhibit identical structures but with longer bond distances, red shifted absorption bands, and in the case of the cuboidal aqua complexes less-pos. redn. potentials. By analogy with $[\text{Mo}_3\text{S}_4(\text{H}_2\text{O})_9]^{4+}$, $[\text{Mo}_3\text{MSe}_4(\text{H}_2\text{O})_{10}]^{4+}$ heterometal cuboidal and related complexes are obtained. The EDTA complex of the 5+ cube $[\text{Mo}_4\text{Se}_4(\text{EDTA})_2]^{3-}$ was prepd., and redn. potentials for the corresponding core 5+/4+ and 6+/5+ couples detd. as -40 and 650 mV, resp.

IT 26998-42-5P

(formation and electrochem. redn. of, in presence of selenium followed by aerial oxidn.)

RN 26998-42-5 HCA

CN Molybdate(2-), bis[L-cysteinato(2-)-.kappa.N,.kappa.O,.kappa.S]di-.mu.-oxodioxodi-, (Mo-Mo)-, disodium (9CI) (CA INDEX NAME)



● 2 Na⁺

IT 147893-30-9P 147893-32-1P 148219-04-9P

(prepn. and crystal structure of)

RN 147893-30-9 HCA

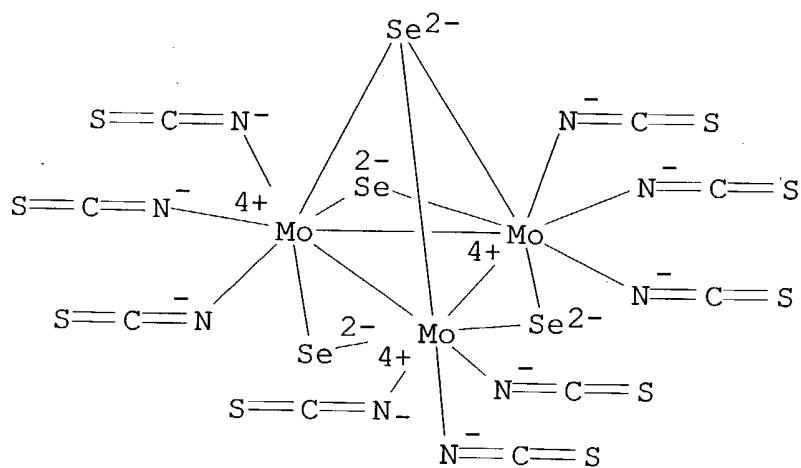
CN Methanaminium, N,N,N-trimethyl-, tri-.mu.-selenoxo-.mu.3-selenoxononakis(thiocyanato-N)trimolybdate(5-) triangulo (5:1) (9CI)
(CA INDEX NAME)

CM 1

CRN 147893-29-6

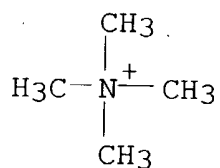
CMF C9 Mo3 N9 S9 Se4

CCI CCS



CM 2

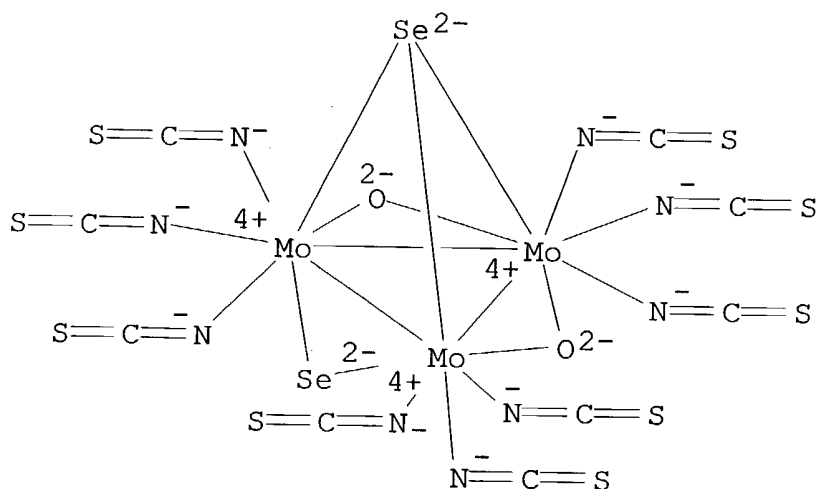
CRN 51-92-3
CMF C4 H12 N



RN 147893-32-1 HCA
CN Methanaminium, N,N,N-trimethyl-, di-.mu.-oxo-.mu.-selenoxo-.mu.3-selenoxononakis(thiocyanato-N)trimolybdate(5-) triangulo (5:1) (9CI)
(CA INDEX NAME)

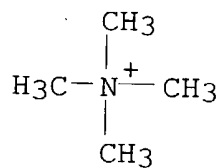
CM 1

CRN 147893-31-0
CMF C9 Mo3 N9 O2 S9 Se2
CCI CCS



CM 2

CRN 51-92-3
CMF C4 H12 N



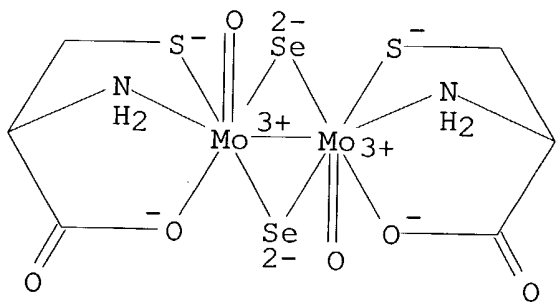
RN 148219-04-9 HCA
 CN Methanaminium, N,N,N-trimethyl-, sodium stereoisomer of
 bis[L-cysteinato(2-)-N,O,S]dioxodi-.mu.-selenoxodimolybdate(2-)
 (Mo-Mo) (1:1:1), heptahydrate (9CI) (CA INDEX NAME)

CM 1

CRN 148219-03-8
 CMF C6 H10 Mo2 N2 O6 S2 Se2 . C4 H12 N . Na

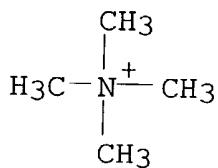
CM 2

CRN 148219-02-7
 CMF C6 H10 Mo2 N2 O6 S2 Se2
 CCI CCS



CM 3

CRN 51-92-3
 CMF C4 H12 N

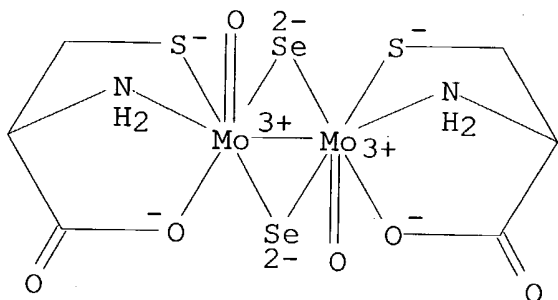


IT 148161-50-6P

(prepn. and mol. structure and aquation and redn. of)

RN 148161-50-6 HCA

CN Molybdate(2-), bis[L-cysteinato(2-)-N,O,S]dioxodi-.mu.-selenoxodi-,
(Mo-Mo), dicesium, stereoisomer (9CI) (CA INDEX NAME)



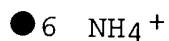
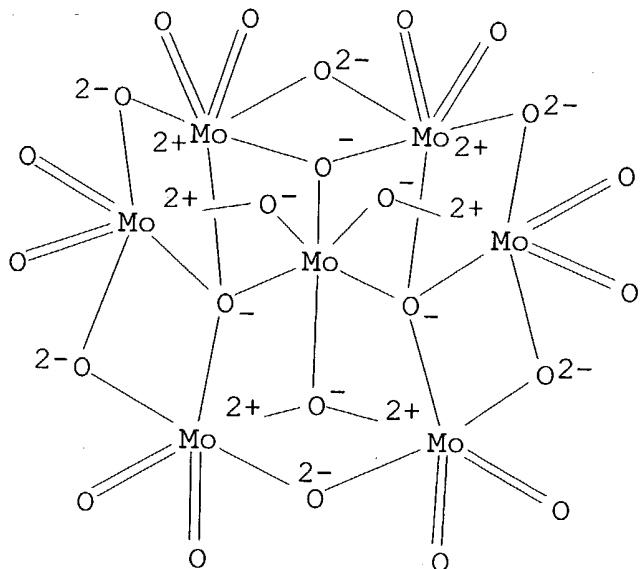
● 2 Cs⁺

IT 12027-67-7, Ammonium molybdate ((NH₄)₆Mo₇O₂₄))

(reaction of, with cysteine and selenide or hydrazine)

RN 12027-67-7 HCA

CN Molybdate (Mo₇O₂₄6-), hexaammonium (9CI) (CA INDEX NAME)



- IT 7783-06-4D, Hydrogen sulfide (H₂S), molybdenum complex
(with EDTA, redn. potential of)
- RN 7783-06-4 HCA
- CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)
- H₂S
- CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
- IT 26998-42-5P
(formation and electrochem. redn. of, in presence of selenium followed by aerial oxidn.)
- IT 129681-93-2P 147893-30-9P 147893-32-1P
148219-04-9P
(prepn. and crystal structure of)
- IT 148161-50-6P
(prepn. and mol. structure and aquation and redn. of)
- IT 12027-67-7, Ammonium molybdate ((NH₄)₆Mo₇O₂₄)
(reaction of, with cysteine and selenide or hydrazine)
- IT 7783-06-4D, Hydrogen sulfide (H₂S), molybdenum complex

(with EDTA, redn. potential of)

L27 ANSWER 9 OF 20 HCA COPYRIGHT 2004 ACS on STN

118:168764 Benzyltriethylammonium tetrathiomolybdate: an improved sulfur transfer reagent for the synthesis of disulfides. Ramesha, A. R.; Chandrasekaran, S. (Dep. Org. Chem., Indian Inst. Sci., Bangalore, 560 012, India). Synthetic Communications, 22(22), 3277-84 (English) 1992. CODEN: SYNCAV. ISSN: 0039-7911. OTHER SOURCES: CASREACT 118:168764.

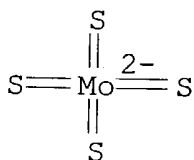
AB Benzyltriethylammonium tetrathiomolybdate is a superior reagent for the conversion of alkyl halides to the corresponding disulfides in chloroform at room temp. Thus, 4-O₂NC₆H₄CH₂Br was treated with (PhCH₂NEt₃)₂MoS₄ in CHCl₃ to give 80% 4-O₂NC₆H₄CH₂SSCH₂C₆H₄NO₂-4.

IT 15060-55-6P

(prepn. and reaction of, with benzyltriethylammonium chloride)

RN 15060-55-6 HCA

CN Molybdate(2-), tetrathioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



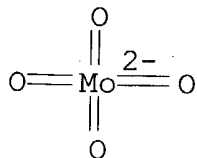
● 2 NH₄⁺

IT 13106-76-8, Ammonium molybdate

(reaction of, with **hydrogen sulfide** in synthesis of benzyltriethylammonium tetrathiomolybdate)

RN 13106-76-8 HCA

CN Molybdate (MoO₄²⁻), diammonium, (T-4)- (9CI) (CA INDEX NAME)

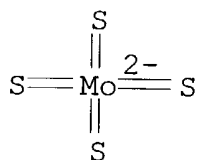


● 2 NH₄⁺

IT 146785-42-4
 (reagent, for conversion of alkyl halides to disulfides, prepn.
 of)
 RN 146785-42-4 HCA
 CN Benzenemethanaminium, N,N,N-triethyl-, (T-4)-tetrathioxomolybdate(2-
) (2:1) (9CI) (CA INDEX NAME)
 CM 1
 CRN 16652-03-2
 CMF C13 H22 N

$\text{Et}_3^+\text{N}-\text{CH}_2-\text{Ph}$

CM 2
 CRN 16330-92-0
 CMF Mo S4
 CCI CCS



CC 25-9 (Benzene, Its Derivatives, and Condensed Benzenoid Compounds)
 IT 15060-55-6P
 (prepn. and reaction of, with benzyltriethylammonium chloride)
 IT 13106-76-8, Ammonium molybdate
 (reaction of, with **hydrogen sulfide** in
 synthesis of benzyltriethylammonium tetrathiomolybdate)
 IT 146785-42-4
 (reagent, for conversion of alkyl halides to disulfides, prepn.
 of)

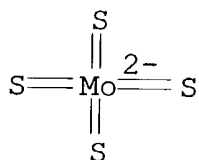
L27 ANSWER 10 OF 20 HCA COPYRIGHT 2004 ACS on STN
 118:24625 Ternary molybdenum chalcogenides, and their manufacture.
 Rabiller-Baudry, Murielle; Faure, Annicke; Lesparre, Jean; Sergent,
 Marcel; Chevrel, Roger (Atochem, Fr.). Fr. Demande FR 2667587 A1
 19920410, 16 pp. (French). CODEN: FRXXBL. APPLICATION: FR
 1991-188 19910109.
 AB The chalcogenides have general formula MxMo_6S_8 ($x = 0-4$; $M = \text{metal}$)
 and are deposited on a porous support. The chalcogenides are

manufd. by reducing MoS₂ and a metal M, or their precursors, deposited on porous supports by impregnation, with H. The chalcogenides are mech. more resistant than the prior-art catalysts, and are used as oxychlorination catalysts. A dispersion of Al₂O₃ 10 in a soln. of (NH₄)₆Mo₇O₂₄·4H₂O 1.5 and Cu(NO₃)₂·3H₂O 1.36 g in 5 mL concd. NH₄OH was left on the air for 1.5 h, dried in air at 120.degree. for 2 h, the material was calcined in air at 500.degree. for 2 h, sulfided with H₂S at 400.degree. for 30 min, and reduced with H (1.5 mL/s) for 49 h to give a mixt. of Cu_xMo₆S₈ and MoS₂ (by x-ray; K threshold of Mo). C₂H₄ 4.4 was oxychlorinated at 230.degree. in a mixt. of air 16.2 and HCl 8.6 std. L/h using Cu_{2.5}Mo₆S₈ 4.25 on Al₂O₃ 6.00 and SiO₂ 22.60 g. The conversion of C₂H₄ was 78.5 and the selectivity for C₂H₄Cl₂ 99.2, vs. 72.3 and 99.1 for a conventional catalyst.

IT 7783-06-4, **Hydrogen sulfide**, reactions
 (reaction of, with ammonium heptamolybdate-cupric nitrate mixts. on alumina, for copper molybdenum sulfide-molybdenum disulfide oxychlorination catalyst manuf.)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

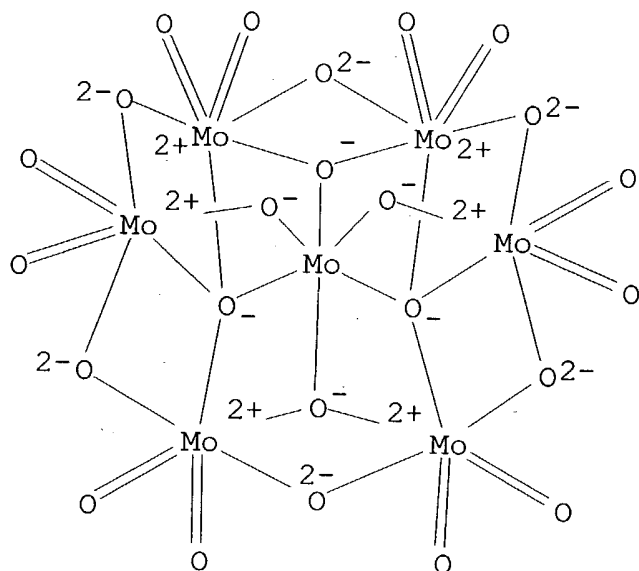
IT 15060-55-6, Ammonium molybdenum sulfide [(NH₄)₂MoS₄]
 (reaction of, with cupric chloride, for copper molybdenum sulfide, for oxychlorination catalysts)
 RN 15060-55-6 HCA
 CN Molybdate(2-), tetrathio-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

IT 12027-67-7, Ammonium heptamolybdate
 (reaction of, with cupric nitrate, on alumina, in copper molybdenum sulfide-molybdenum disulfide oxychlorination catalyst manuf.)
 RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH₄⁺

- IC ICM C01G039-06
ICS C01G003-12
- CC 49-5 (Industrial Inorganic Chemicals)
Section cross-reference(s): 67
- IT **7783-06-4, Hydrogen sulfide**, reactions
(reaction of, with ammonium heptamolybdate-cupric nitrate mixts. on alumina, for copper molybdenum sulfide-molybdenum disulfide oxychlorination catalyst manuf.)
- IT **15060-55-6, Ammonium molybdenum sulfide** [(NH₄)₂MoS₄]
(reaction of, with cupric chloride, for copper molybdenum sulfide, for oxychlorination catalysts)
- IT 3251-23-8, Cupric nitrate **12027-67-7, Ammonium heptamolybdate**
(reaction of, with cupric nitrate, on alumina, in copper molybdenum sulfide-molybdenum disulfide oxychlorination catalyst manuf.)
- L27 ANSWER 11 OF 20 HCA COPYRIGHT 2004 ACS on STN
111:236408 Dispersed-phase catalysts in coal liquefaction. Utz, Bruce R.; Cugini, Anthony V.; Frommell, Elizabeth A. (Dep. Energy, Pittsburgh Energy Technol. Cent., Pittsburgh, PA, 15236, USA).
Preprints of Papers - American Chemical Society, Division of Fuel

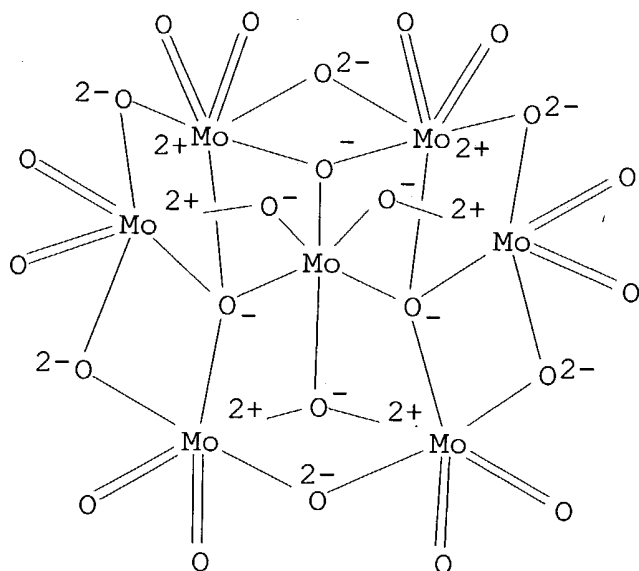
Chemistry, 34(4), 1423-30 (English) 1989. CODEN: ACFPAI. ISSN: 0569-3772.

AB Two catalyst precursors that result in high conversions of coal to solvent-sol. products were identified when heated rapidly to reaction temp. The use of MoS_3 and $(\text{NH}_4)_2\text{MoS}_4$ as catalyst precursors, rather than $(\text{NH}_4)_6\text{Mo}_2\text{O}_{24}$, offers a no. of advantages. Both catalyst precursors are in a sulfided form and therefore addnl. H_2S is not required, but $(\text{NH}_4)_6\text{Mo}_2\text{O}_{24}$ requires the addn. of H_2S in order to form the oxysulfide intermediates and the final product, MoS_2 . Both of the sulfided precursors are activated and highly dispersed when heated rapidly to reaction temp., while $(\text{NH}_4)_6\text{Mo}_2\text{O}_{24}$ requires a gradual heating, so the activation of $(\text{NH}_4)_6\text{Mo}_2\text{O}_{24}$ is much more energy intensive. The ultimate goal is to identify a dry, highly dispersed catalyst precursor or catalyst that can be added to a coal-vehicle feed without the addn. of water and that results in yields of coal-derived products comparable to those given by water- or oil-sol. catalyst precursors. Possibly MoS_3 is the catalyst precursor that satisfies those requirements.

IT 12027-67-7, Ammonium heptamolybdate 15060-55-6
(precursors, for molybdenum disulfide catalysts, for coal hydroliquefaction)

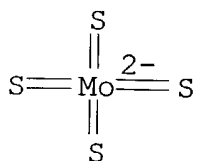
RN 12027-67-7 HCA

CN Molybdate ($\text{Mo}_7\text{O}_{24}^{6-}$), hexaammonium (9CI) (CA INDEX NAME)



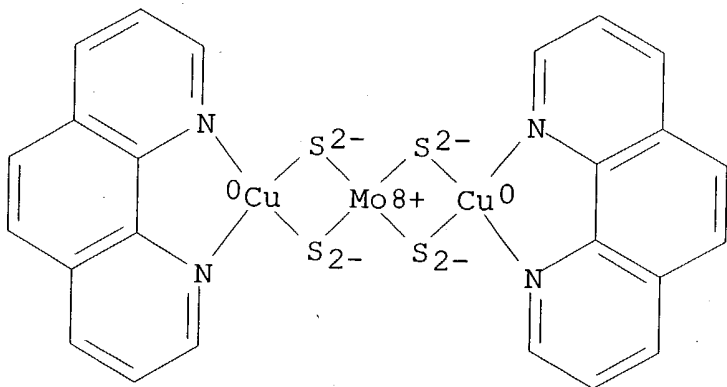
● 6 NH_4^+

RN 15060-55-6 HCA
 CN Molybdate(2-), tetrathioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)

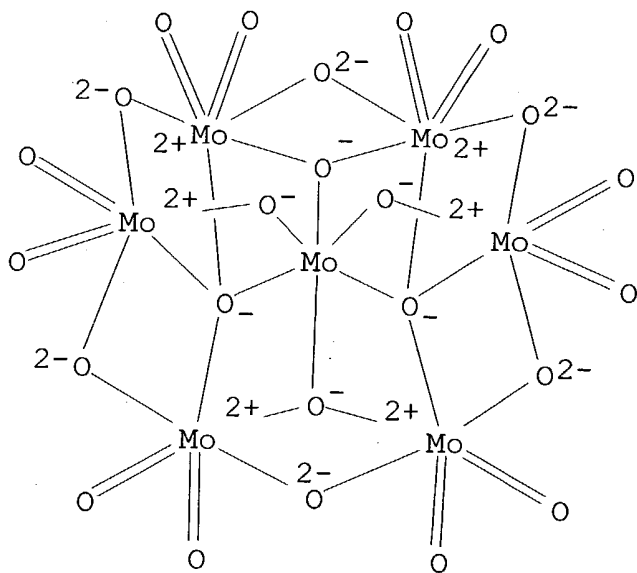


● 2 NH₄⁺

- CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
 Section cross-reference(s): 67
- IT 1317-33-5, Molybdenum disulfide, uses and miscellaneous
12027-67-7, Ammonium heptamolybdate **15060-55-6**
 (precursors, for molybdenum disulfide catalysts, for coal
 hydroliquefaction)
- L27 ANSWER 12 OF 20 HCA COPYRIGHT 2004 ACS on STN
 111:16692 Difference in the antagonistic behavior of tetrathiomolybdate
 and tetrathiotungstate towards copper. Mishra, S. B. S.; Sarkar, S.
 (Inst. Eng. Technol., Lucknow, 226 020, India). Indian Journal of
 Chemistry, Section A: Inorganic, Physical, Theoretical &
 Analytical, 28A(1), 72-3 (English) 1989. CODEN: IJCADU. ISSN:
 0376-4710.
- AB Freshly-pptd. CuS can be solubilized by allowing it to stand in aq.
 medium contg. MoS₄²⁻. [(PPh₃)₃Cu₂MoS₄] and [(phen)₂Cu₂MoS₄] (phen =
 o-phenanthroline) were isolated by reaction of the resultant soln.
 with PPh₃ and phen which indicate the in situ generation of
 {Cu₂MoS₄} species. The reaction was carried out to mimic a possible
 reaction in the rumen and to rationalize the chem. implications of
 Cu-Mo antagonism. A dramatic difference in the antagonistic
 behavior of MoS₄²⁻ and WS₄²⁻ towards Cu was demonstrated.
- IT **106639-21-8P**
 (prepn. of, from heptamolybdate and copper chloride and
hydrogen sulfide followed by reaction with
 phenanthroline)
- RN 106639-21-8 HCA
 CN Molybdenum, bis[(1,10-phenanthroline-N1,N10)copper]tetra-.mu.-thioxo-
 (9CI) (CA INDEX NAME)



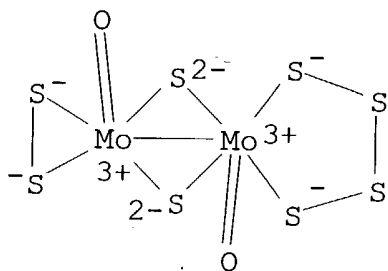
IT 12027-67-7, Ammonium molybdate ((NH₄)₆Mo₇O₂₄)
 (reaction of, with copper dichloride and **hydrogen sulfide** followed by reaction with triphenylphosphine or phenanthroline)
 RN 12027-67-7 HCA
 CN Molybdate (Mo₇O₂₄6-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH₄⁺

CC 78-7 (Inorganic Chemicals and Reactions)
 Section cross-reference(s): 6

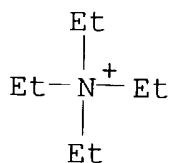
- IT 106639-21-8P
(prepn. of, from heptamolybdate and copper chloride and **hydrogen sulfide** followed by reaction with phenanthroline)
- IT 74542-94-2P
(prepn. of, from heptamolybdate and copper chloride and **hydrogen sulfide** followed by reaction with triphenylphosphine)
- IT 12027-67-7, Ammonium molybdate ((NH₄)₆Mo₇O₂₄)
(reaction of, with copper dichloride and **hydrogen sulfide** followed by reaction with triphenylphosphine or phenanthroline)
- L27 ANSWER 13 OF 20 HCA COPYRIGHT 2004 ACS on STN
- 107:167677 Preparation and structure of the cluster compound (Et₄N)₂(Mo₂O₂S₈). Zhang, Shiwei; Liao, Daiqing; Jin, Xianglin; Tang, Youqi (Phys. Chem. Inst., Peking Univ., Beijing, Peop. Rep. China). Gaodeng Xuexiao Huaxue Xuebao, 8(2), 173-5 (Chinese) 1987. CODEN: KTHPDM. ISSN: 0251-0790.
- AB (Et₄N)₂(Mo₂O₂S₈) was prepd., and its crystal and mol. structures were detd. The compd. crystallizes in orthorhombic, space group Pbca with Z = 8, a 13.197(4), b 15.739(6), c 29.033(6) .ANG.. The compd. contains terminal O ligand, persulfide group, tetrasulfide group, and .mu.-sulfide group, and has a metal-metal bond (Mo-Mo distance 2.822(3) .ANG.).
- IT 110725-32-1P
(prepn. and crystal structure of)
- RN 110725-32-1 HCA
- CN Ethanaminium, N,N,N-triethyl-, stereoisomer of (dithio)dioxo(tetrathio)di-.mu.-thioxodimolybdate(2-) (Mo-Mo) (2:1) (9CI) (CA INDEX NAME)
- CM 1
- CRN 95357-49-6
- CMF Mo₂ O₂ S₈
- CCI CCS



CM 2

CRN 66-40-0

CMF C8 H20 N

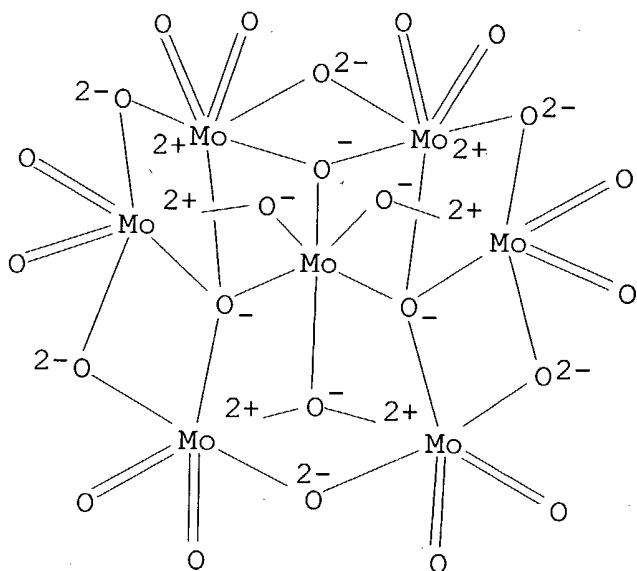


IT 12027-67-7

(reaction of, with hydrogen sulfide)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)

● 6 NH₄⁺CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

IT 110725-32-1P

(prepn. and crystal structure of)

IT 12027-67-7

(reaction of, with hydrogen sulfide)

L27 ANSWER 14 OF 20 HCA COPYRIGHT 2004 ACS on STN

105:117551 Ammonium tetrathiomolybdate. Reilly, Kenneth T.; Munn, Robin W.; Hoffman, Henry E.; Douglas, Alan D. (GTE Products Corp., USA). U.S. ✓US 4604278 A 19860805, 3 pp. (English). CODEN: USXXAM. APPLICATION: US 1985-734985 19850517.

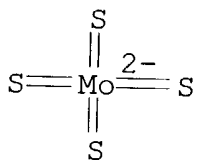
AB Ammonium tetrathiomolybdate (I), useful as a precursor for MoS₂ catalysts and lubricants, is prepd. on a com. scale by treating an ammoniacal molybdate soln. with 0.5-250 psi H₂S in a closed system to give a slurry contg. I, which is sepd., washed with water and EtOH, and dried. The wash water may be recycled to the 1st step. Thus, a soln. prepd. from 13 gal 15N NH₄OH and 5.0 kg ammonium paramolybdate (II) was treated in a sealed tank with 5-8 psi H₂S for 3 h, and at 5-10 psi for 30 min. The resulting slurry was cooled and filtered, and the solid was washed and dried to give 10-15 lb I. The mother liquor 6.5 gal was recycled with further 6.5 gal NH₄OH and 5 kg II to give an addnl. 15-20 lb I.

IT 15060-55-6P

(prepn. of, as precursor for molybdenum sulfide catalysts and lubricants)

RN 15060-55-6 HCA

CN Molybdate(2-), tetrathioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

IT 7783-06-4, reactions

(reaction of, with ammonium molybdate, for ammonium thiomolybdate prepn.)

RN 7783-06-4 HCA

CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

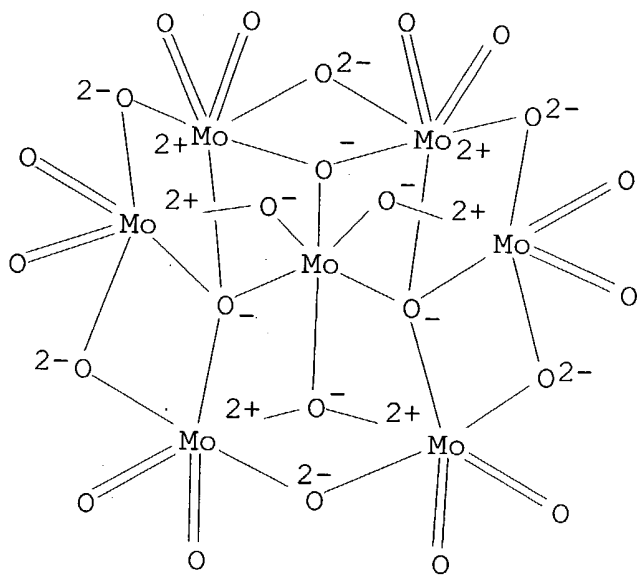
IT 12027-67-7

(reaction of, with hydrogen sulfide, for

ammonium thiomolybdate prepn.)

RN 12027-67-7 HCA

CN Molybdate (Mo7O246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH₄⁺

IC ICM C01G039-00

NCL 423517000

CC 49-5 (Industrial Inorganic Chemicals)

Section cross-reference(s): 51, 67

ST ammonium thiomolybdate molybdenum sulfide precursor;
hydrogen sulfide reaction ammonium molybdate

IT 15060-55-6P

(prepn. of, as precursor for molybdenum sulfide catalysts and lubricants)

IT 7783-06-4, reactions

(reaction of, with ammonium molybdate, for ammonium thiomolybdate prepn.)

IT 12027-67-7

(reaction of, with **hydrogen sulfide**, for ammonium thiomolybdate prepn.)

L27 ANSWER 15 OF 20 HCA COPYRIGHT 2004 ACS on STN

104:36795 Catalysts from molybdenum polysulfide precursors, and their use. Mitchell, Howard L., III; Sawyer, Willard H. (Exxon Research and Engineering Co., USA). U.S. US 4542121 A 19850917, 11 pp.

Cont.-in-part of U.S. 4,430, 442. (English). CODEN: USXXAM.
APPLICATION: US 1984-570364 19840113. PRIORITY: US 1982-399947
19820720.

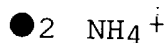
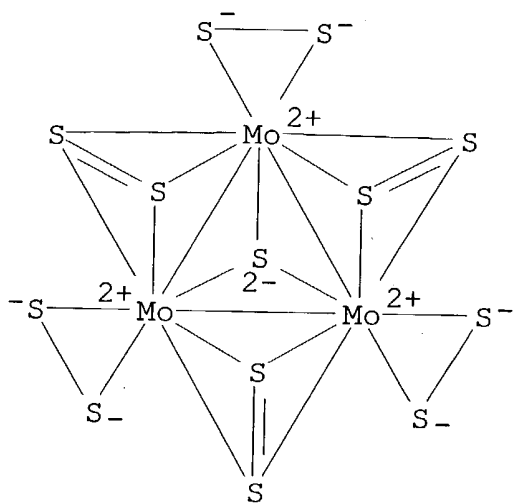
AB Hydrogenation-hydrodenitrogenation-hydrodesulfurization catalysts for petroleum refining are prepd. by decomp. in-situ (i.e., in the presence of H_2S , H , and hydrocarbons) a catalyst precursor salt, $\text{A}(\text{Mo}_3\text{S}_{13})$, in which A is an ammonium or phosphonium ion. The precursor salt, prepd. from $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$ and $(\text{NH}_4)_2\text{S}_x$, can be exchanged with Me_4NCl or $\text{Co}(\text{OAc})_2$ (or both) to form an org. (or Co-exchanged) precursor with Co-Mo wt. ratio 1:5.35-6.9; the precursor can also be supported on Al_2O_3 . Catalyst precursors decompd. in-situ (preferably at 350.degree.) are significantly more active than those decompd. in N_2 .

IT 67031-31-6 89420-48-4

(catalyst precursor, for petroleum hydrorefining)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



RN 89420-48-4 HCA

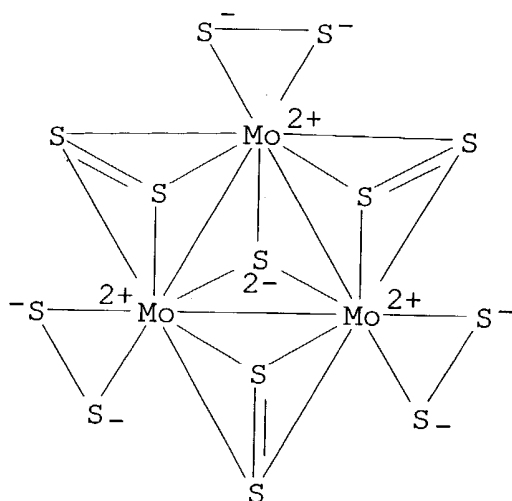
CN Methanaminium, N,N,N-trimethyl-, tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotrimolybdate(2-) (2:1) (9CI) (CA INDEX NAME)

CM 1

CRN 88765-92-8

CMF Mo3 S13

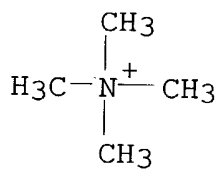
CCI CCS



CM 2

CRN 51-92-3

CMF C4 H12 N

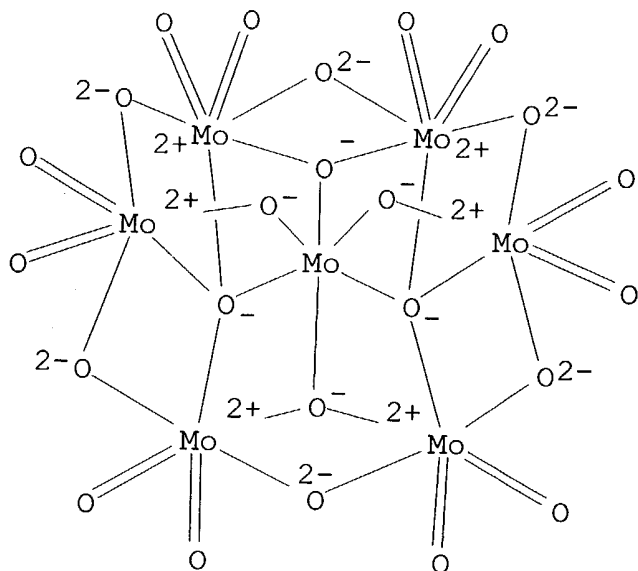


IT 12027-67-7

(polysulfide catalysts precursors from, for petroleum
hydrorefining)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

- IC ICM B01J027-02
ICS B01J031-02; B01J027-24; C01G037-00
NCL 502220000
CC 51-9 (Fossil Fuels, Derivatives, and Related Products)
IT **67031-31-6 89420-48-4**
(catalyst precursor, for petroleum hydrorefining)
IT 71-48-7 75-57-0 **12027-67-7**
(polysulfide catalysts precursors from, for petroleum hydrorefining)
- L27 ANSWER 16 OF 20 HCA COPYRIGHT 2004 ACS on STN
100:142038 Catalysts from molybdenum polysulfide precursors. Sawyer, Willard H.; Mitchell, Howard L., III (Exxon Research and Engineering Co., USA). U.S. US 4430442 A 19840207, 11 pp. (English). CODEN: USXXAM. APPLICATION: US 1982-399947 19820720.
- AB Hydrogenation-hydrodenitrogenation-hydrodesulfurization catalysts for petroleum refining are prep'd. by decomp'g. in-situ (i.e., in the presence of H_2S , H_2 , and hydrocarbons) a catalyst precursor salt, $\text{A}(\text{Mo}_3\text{S}_{13})$, where A is formed from an ammonium comp'd. The precursor salt, prep'd. from $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}$ and $(\text{NH}_4)_2\text{S}_x$, can be exchanged with Me_4NCl [75-57-0] or $\text{Co}(\text{OAc})_2$ [71-48-7] (or both) to form an org. (or Co-exchanged, with Co-Mo wt. ratio 1:5.35-6.9) precursor; the precursor can also be supported on Al_2O_3 . Catalyst

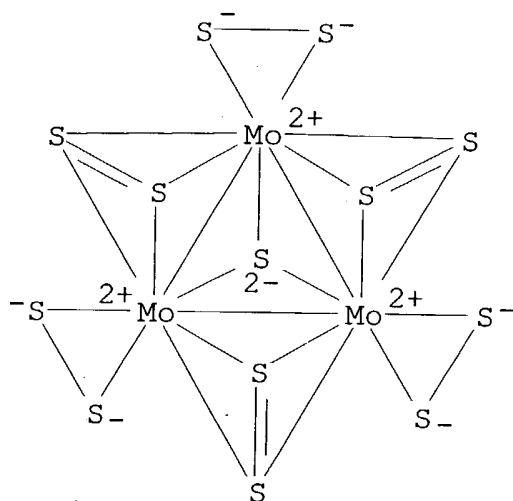
precursors decompd. in-situ (preferably at 350.degree.) are significantly more active than those decompd. in N.

IT 67031-31-6 89420-48-4

(catalyst precursor, for petroleum hydrorefining)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



● 2 NH₄⁺

RN 89420-48-4 HCA

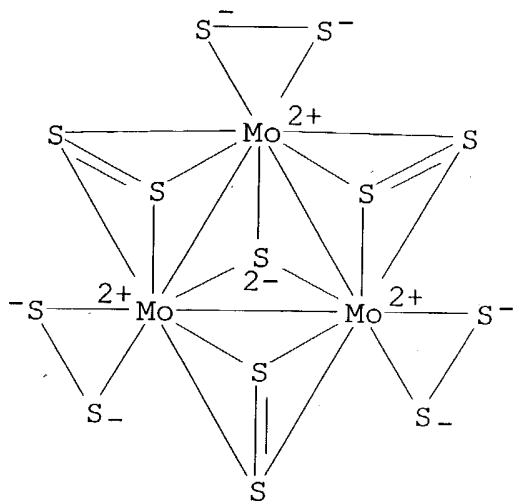
CN Methanaminium, N,N,N-trimethyl-, tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotrimolybdate(2-) (2:1) (9CI) (CA INDEX NAME)

CM 1

CRN 88765-92-8

CMF Mo3 S13

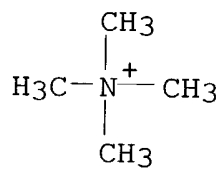
CCI CCS



CM 2

CRN 51-92-3

CMF C4 H12 N

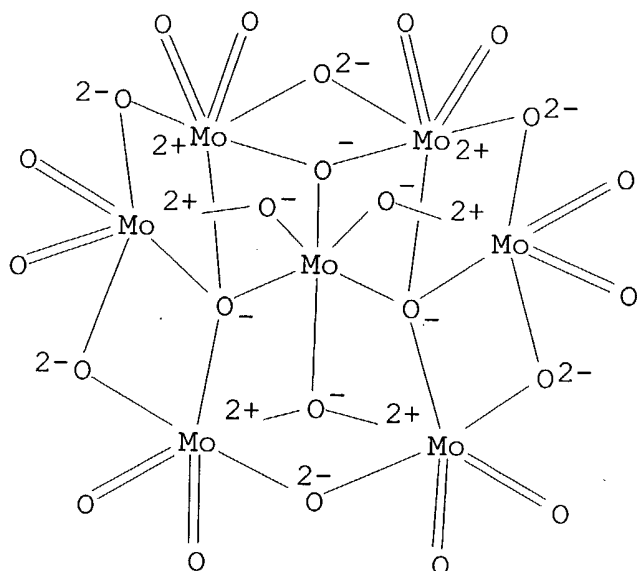


IT 12027-67-7

(polysulfide catalyst precursors from, for petroleum
hydrorefining)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

- IC B01J027-02; B01J031-12; B01J027-24
 NCL 502220000
 CC 51-10 (Fossil Fuels, Derivatives, and Related Products)
 Section cross-reference(s): 67
 IT **67031-31-6 89420-48-4**
 (catalyst precursor, for petroleum hydrotreating)
 IT 71-48-7 75-57-0 **12027-67-7**
 (polysulfide catalyst precursors from, for petroleum
 hydrotreating)
- L27 ANSWER 17 OF 20 HCA COPYRIGHT 2004 ACS on STN
 99:98107 Syntheses and characterization of ammonium and
 tetraalkylammonium thiomolybdates and thiotungstates. McDonald,
 John W.; Friesen, G. Delbert; Rosenheim, Laurence D.; Newton,
 William E. (Charles F. Kettering Res. Lab., Yellow Springs, OH,
 45387, USA). Inorganica Chimica Acta, 72(2), 205-10 (English) 1983.
 CODEN: ICHAA3. ISSN: 0020-1693.
- AB Improved methods for the prepn. of $[\text{NH}_4]_2[\text{Mo}_2\text{S}_2]$ and $[\text{NH}_4]_2[\text{MS}_4]$ ($\text{M} = \text{Mo}, \text{W}$) are summarized and new syntheses of $[\text{NH}_4]_2[\text{MoS}_3]$ are
 reported. The facile conversion of the NH_4^+ salts to Et_4N^+ salts
 via reaction with aq. Et_4NOH is also described. IR and electronic
 spectral data for the thiometallates are summarized as an aid to
 future characterization.

IT 86915-91-5P

(prepn. from diammonium dioxodithiomolybdate and
tetraethylammonium hydroxide)

RN 86915-91-5 HCA

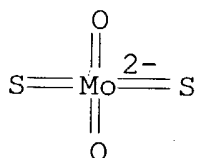
CN Ethanaminium, N,N,N-triethyl-, (T-4)-dioxodithioxomolybdate(2-)
(2:1) (9CI) (CA INDEX NAME)

CM 1

CRN 16608-22-3

CMF Mo O2 S2

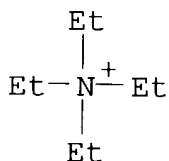
CCI CCS



CM 2

CRN 66-40-0

CMF C8 H20 N



IT 86915-90-4P

(prepn. from diammonium oxotriithiomolybdate and
tetraethylammonium hydroxide)

RN 86915-90-4 HCA

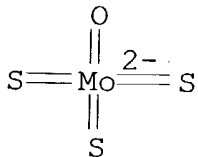
CN Ethanaminium, N,N,N-triethyl-, (T-4)-oxotriithioxomolybdate(2-) (2:1)
(9CI) (CA INDEX NAME)

CM 1

CRN 19452-56-3

CMF Mo O S3

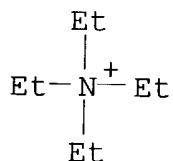
CCI CCS



CM 2

CRN 66-40-0

CMF C8 H20 N



IT 14348-09-5P

(prepn. from diammonium tetrathiomolybdate and tetraethylammonium hydroxide)

RN 14348-09-5 HCA

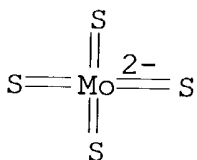
CN Ethanaminium, N,N,N-triethyl-, (T-4)-tetrathioxomolybdate(2-) (2:1)
(9CI) (CA INDEX NAME)

CM 1

CRN 16330-92-0

CMF Mo S4

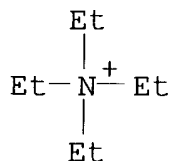
CCI CCS



CM 2

CRN 66-40-0

CMF C8 H20 N

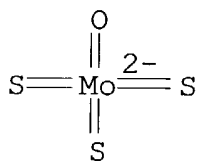


IT 42761-49-9P

(prepn. from disodium molybdate and ammonium hydroxide and
hydrogen sulfide and reaction with
 tetraethylammonium hydroxide)

RN 42761-49-9 HCA

CN Molybdate(2-), oxotriethio-, diammonium, (T-4)- (9CI) (CA INDEX
 NAME)

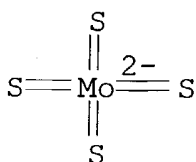
●2 NH₄⁺

IT 15060-55-6P

(prepn. from disodium molybdate or hexaammonium heptamolybdate
 and ammonium hydroxide and **hydrogen sulfide**
 and reaction with tetraethylammonium hydroxide)

RN 15060-55-6 HCA

CN Molybdate(2-), tetrathio-, diammonium, (T-4)- (9CI) (CA INDEX
 NAME)

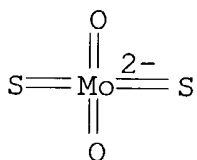
●2 NH₄⁺

IT 16150-60-0P

(prepn. from hexaammonium heptamolybdate and ammonium hydroxide and **hydrogen sulfide** and reaction with tetraethylammonium hydroxide)

RN 16150-60-0 HCA

CN Molybdate(2-), dioxodithio-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



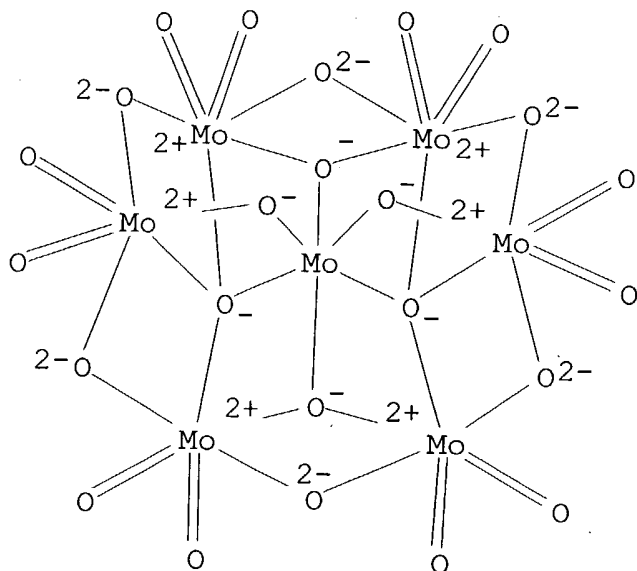
●2 NH₄⁺

IT 12027-67-7

(reactions with cesium chloride or ammonium hydroxide and **hydrogen sulfide**, oxo- or oxothiomolybdate salts from)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

- CC 78-5 (Inorganic Chemicals and Reactions)
 IT **86915-91-5P**
 (prepn. from diammonium dioxodithiomolybdate and tetraethylammonium hydroxide)
 IT **86915-90-4P**
 (prepn. from diammonium oxotriithiomolybdate and tetraethylammonium hydroxide)
 IT **14348-09-5P**
 (prepn. from diammonium tetrathiomolybdate and tetraethylammonium hydroxide)
 IT **42761-49-9P**
 (prepn. from disodium molybdate and ammonium hydroxide and **hydrogen sulfide** and reaction with tetraethylammonium hydroxide)
 IT **15060-55-6P**
 (prepn. from disodium molybdate or hexaammonium heptamolybdate and ammonium hydroxide and **hydrogen sulfide** and reaction with tetraethylammonium hydroxide)
 IT **16150-60-0P**
 (prepn. from hexaammonium heptamolybdate and ammonium hydroxide and **hydrogen sulfide** and reaction with tetraethylammonium hydroxide)
 IT 86915-92-6P

(prepn. from hexaammonium heptamolybdate and cesium chloride and **hydrogen sulfide**)

IT 13862-78-7P 16150-61-1P 52748-63-7P

(prepn. from tungstic acid and ammonium hydroxide and **hydrogen sulfide** and reaction with tetraethylammonium hydroxide)

IT 12027-67-7

(reactions with cesium chloride or ammonium hydroxide and **hydrogen sulfide**, oxo- or oxothiomolybdate salts from)

L27 ANSWER 18 OF 20 HCA COPYRIGHT 2004 ACS on STN

89:69916 Synthesis and electrochemistry of oxo- and sulfido-bridged molybdenum(V) complexes with 1,1-dithiolate ligands. Schultz, Franklin A.; Ott, Virginia R.; Rolison, Debra S.; Bravard, Dudley C.; McDonald, John W.; Newton, William E. (Dep. Chem., Florida Atlantic Univ., Boca Raton, FL, USA). Inorganic Chemistry, 17(7), 1758-65 (English) 1978. CODEN: INOCAJ. ISSN: 0020-1669.

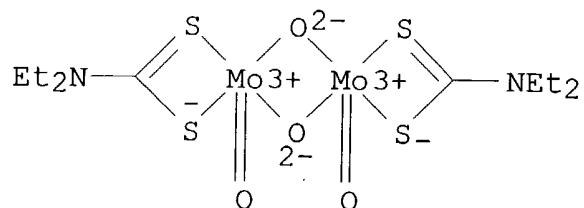
AB A no. of oxo- and sulfido-bridged Mo(V) complexes with the 1,1-dithiolate ligands, N,N-diethyldithiocarbamate (dtc), diisopropyldithiophosphinate (dtp), and 1,1-dicyanoethylene-2,2-dithiolate (mnt), were prepd. The dtc complexes constitute the first series of compds. in which bridging and terminal oxo groups have been sequentially replaced by sulfido in the binuclear Mo₂X₄2+ core to yield all members of a single family from Mo₂O₄(dtc)₂ to Mo₂S₄(dtc)₂. The IR spectra reveal the characteristic behavior of Mo-O and Mo-S stretching frequencies in the binuclear unit following O or S substitution at the bridging or terminal positions. Electrochem. of the compds. in Me₂SO was studied by cyclic voltammetry, chronoamperometry, and controlled-potential coulometry. The sulfido-bridged dtc and mnt complexes undergo successive one-electron redns. to Mo(V)-Mo(IV) and Mo(IV)-Mo(IV) species. The ease of prodn. and chem. stability of the one- and two-electron redn. products increase with increasing S substitution, although none of these products are stable on an extended time scale. The effect of ligand on electrochem. behavior, possible mechanisms for decompn. of the Mo(V)-Mo(IV) species, and comparisons to previous electrochem. studies of sulfido-bridged Mo(V)-Mo(V) complexes in nonaq. media are discussed.

IT 50860-31-6

(electrochem. redn. of)

RN 50860-31-6 HCA

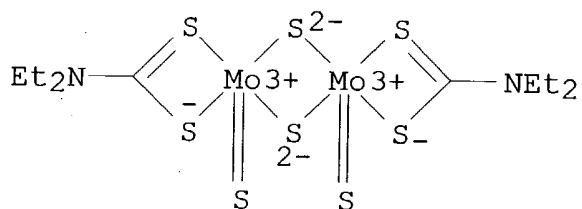
CN Molybdenum, bis(diethylcarbamoedithioato-.kappa.S,.kappa.S')di-.mu.-oxodioxodi- (9CI) (CA INDEX NAME)



IT 36539-27-2P 55723-33-6P 59389-04-7P
 63912-48-1P 66290-40-2P
 (prepn. and electrochem. redn. of)

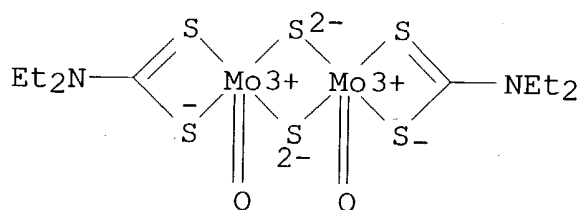
RN 36539-27-2 HCA

CN Molybdenum, bis(diethylcarbamodithioato-.kappa.S,.kappa.S')di-.mu.-thioxodithioxodi- (9CI) (CA INDEX NAME)



RN 55723-33-6 HCA

CN Molybdenum, bis(diethylcarbamodithioato-.kappa.S,.kappa.S')dioxodi-.mu.-thioxodi- (9CI) (CA INDEX NAME)



RN 59389-04-7 HCA

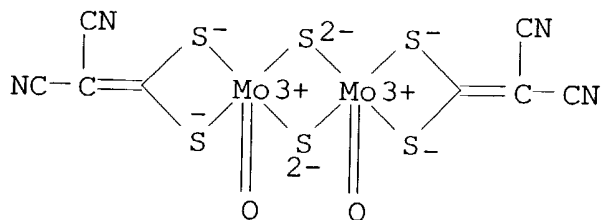
CN 1-Butanaminium, N,N,N-tributyl-, stereoisomer of bis[(dimercaptomethylene)propanedinitrilato(2-)-S,S']dioxodi-.mu.-thioxodimolybdate(2-) (2:1) (9CI) (CA INDEX NAME)

CM 1

CRN 59389-03-6

CMF C8 Mo2 N4 O2 S6

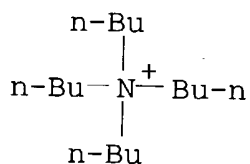
CCI CCS



CM 2

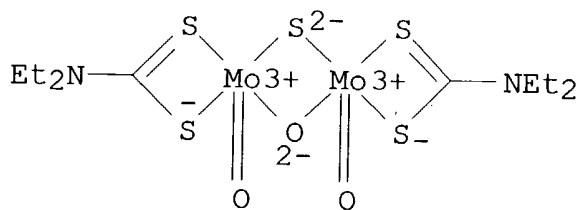
CRN 10549-76-5

CMF C16 H36 N



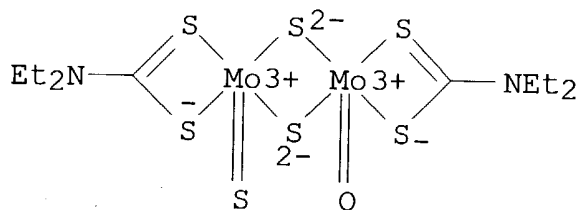
RN 63912-48-1 HCA

CN Molybdenum, bis(diethylcarbamodithioato-S,S')-.mu.-oxodioxo-.mu.-thioxodi-, stereoisomer (9CI) (CA INDEX NAME)



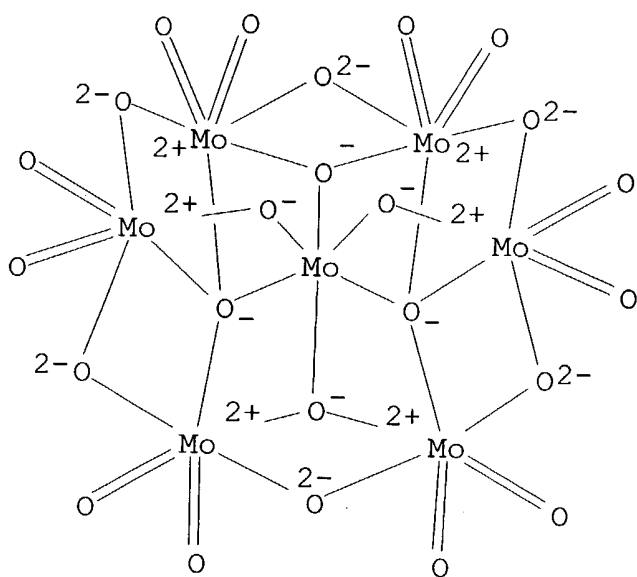
RN 66290-40-2 HCA

CN Molybdenum, bis(diethylcarbamodithioato-S,S')oxodi-.mu.-thioxothioxodi- (9CI) (CA INDEX NAME)



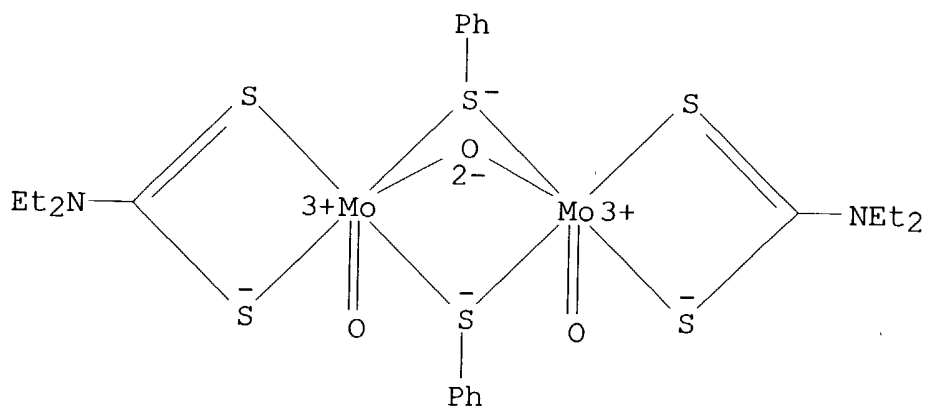
IT 12027-67-7

(reaction of, with dipotassium 2,2-dicyanoethenedithioate)
 RN 12027-67-7 HCA
 CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

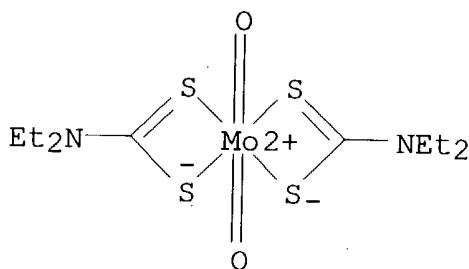
IT 63016-34-2
 (reaction of, with hydrogen sulfide)
 RN 63016-34-2 HCA
 CN Molybdenum, bis[.mu.-(benzenethiolato)]bis(diethylcarbamodithioato-S,S')-.mu.-oxodioxodi-, stereoisomer (9CI) (CA INDEX NAME)



IT 19680-83-2

(redn. of, by zinc dust in thiophenol soln.)

RN 19680-83-2 HCA

CN Molybdenum, bis(diethylcarbamodithioato-.kappa.S,.kappa.S')dioxo-,
(OC-6-21)- (9CI) (CA INDEX NAME)

CC 78-7 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 72

IT 50860-31-6

(electrochem. redn. of)

IT 36539-27-2P 55723-33-6P 59389-04-7P

63912-48-1P 63912-56-1P 63912-57-2P 66290-40-2P
66322-51-8P

(prepn. and electrochem. redn. of)

IT 12027-67-7

(reaction of, with dipotassium 2,2-dicyanoethenedithioate)

IT 63016-34-2 66290-39-9

(reaction of, with hydrogen sulfide)

IT 19680-83-2

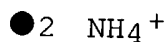
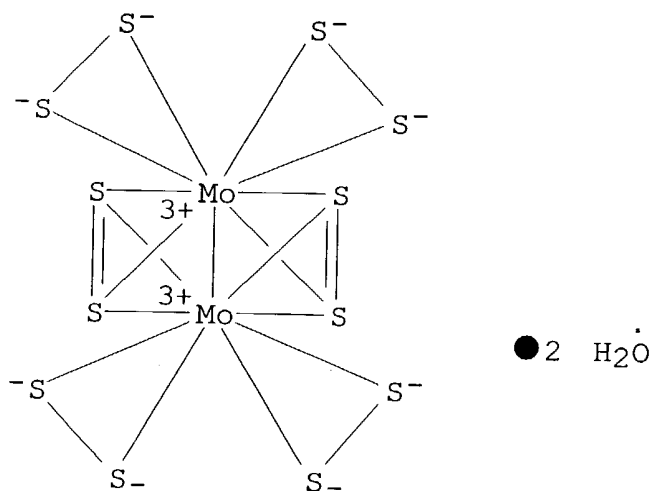
(redn. of, by zinc dust in thiophenol soln.)

L27 ANSWER 19 OF 20 HCA COPYRIGHT 2004 ACS on STN

88:181663 [(S₂)₂Mo(S₂)₂Mo(S₂)₂]₂-, a new complex with only disulfur(2-) ligands and a molybdenum-molybdenum bond. Mueller, Achim; Nolte, Wulf Otto; Krebs, Bernt (Fak. Chem., Univ. Bielefeld, Bielefeld, Fed. Rep. Ger.). Angewandte Chemie, 90(4), 286-7 (German) 1978. CODEN: ANCEAD. ISSN: 0044-8249.

AB An aq. ammoniacal soln. of (NH₄)₆Mo₇O₂₄·4H₂O was satd. with H₂S and then heated to redissolve the (NH₄)₂MoS₄ ppt.; this red soln. was added to a satd. ammonium polysulfide soln. From the reaction mixt., stored in a closed vessel, a ppt. slowly formed from which long needles of (NH₄)₂[(S₂)₂Mo(S₂)₂Mo(S₂)₂].2H₂O (I) were obtained. I was characterized by elementary anal., DTA, thermogravimetric, and magnetic measurements, ESCA and IR spectra, and crystal structure anal. I is orthorhombic, space group Pnna - D₂h, with a 21.614, b 13.127, c 12.576 .ANG.; Z = 12. Both Mo(V) central atoms are in a distorted dodecahedral environment with 4 side-on disulfide groups surrounding each; with the Mo-Mo bond, each

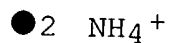
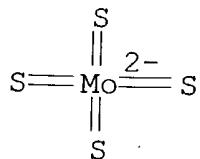
Mo has a coordination no. 9.
 IT **65878-95-7P**
 (prepn. and crystal structure of)
 RN 65878-95-7 HCA
 CN Molybdate(2-), bis[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tetrakis(dithio)di-, (Mo-Mo), diammonium, dihydrate (9CI) (CA INDEX NAME)



IT **7783-06-4**, reactions
 (reaction of, with ammonium heptamolybdate)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

IT **15060-55-6**
 (reaction of, with ammonium polysulfide)
 RN 15060-55-6 HCA
 CN Molybdate(2-), tetrathio-, diammonium, (T-4)- (9CI) (CA INDEX NAME)

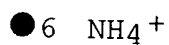
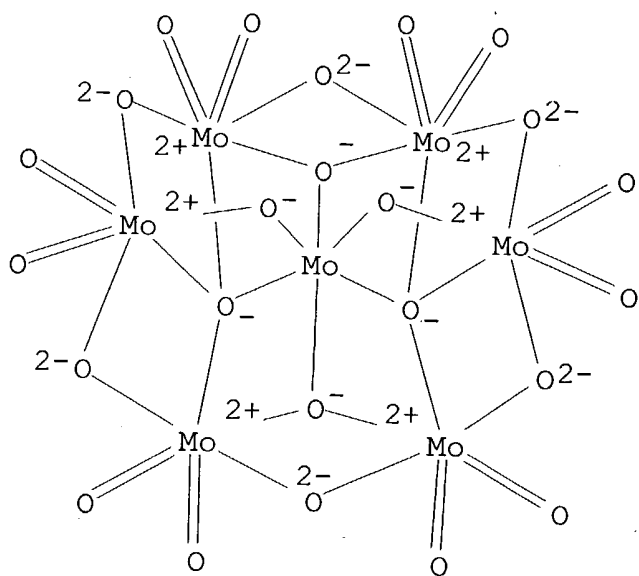


IT 12027-67-7

(reaction of, with **hydrogen sulfide**)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

IT 65878-95-7P

(prepn. and crystal structure of)

IT 7783-06-4, reactions

(reaction of, with ammonium heptamolybdate)

IT 15060-55-6

(reaction of, with ammonium polysulfide)

IT 12027-67-7

(reaction of, with **hydrogen sulfide**)

L27 ANSWER 20 OF 20 HCA COPYRIGHT 2004 ACS on STN

79:99918 Spectrochemical study of oxythiopolybdates. Fridman, Ya. D.; Mikhailyuk, L. Ya.; Chalkov, G. I.; Tursunova, G. A. (Inst. Neorg. Fiz. Khim., Frunze, USSR). Zhurnal Neorganicheskoi Khimii, 18(7), 1836-42 (Russian) 1973. CODEN: ZNOKAQ. ISSN: 0044-457X.

AB From spectrophotometric studies, $(\text{NH}_4)_2\text{MoO}_2\text{S}_2$ (I) reacts in the presence of HCl at pH 4.35 to give $(\text{NH}_4)_4\text{H}_6[\text{H}_2(\text{MoO}_2\text{S}_2)_6]$. In dil. HCl I forms $\text{H}_{10}[\text{H}_2(\text{MoO}_2\text{S}_2)_6]$ whereas in concd. HCl I decomps. to H_2MoO_4 , MoS_3 , **H₂S**, and NH_4Cl . Equimolar amts. of I and $(\text{NH}_4)_2\text{MoS}_4$ react to give $(\text{NH}_4)_2\text{MoOS}_3$ which reacts with HCl at pH 5 to give $(\text{NH}_4)_3\text{H}_7[\text{H}_2(\text{MoOS}_3)_6]$; in concd. HCl, $\text{H}_{10}[\text{H}_2(\text{MoOS}_3)_6]$ is formed. $(\text{NH}_4)_2\text{MoO}_3\text{S}$, which is formed from I and $(\text{NH}_4)_2\text{MoO}_4$, reacts with HCl to give $\text{H}_{10}[\text{H}_2(\text{Mo}_2\text{O}_6\text{S})_6]$. $\text{K}_3\text{H}_7[\text{H}_2(\text{Mo}_2\text{O}_5\text{S}_2)_6]$, isolated from the oxidn. reaction of I by iodine (equimolar amts. in the presence of KI or NH_4I , forms $\text{H}_{10}[\text{H}_2(\text{Mo}_2\text{O}_5\text{S}_2)_6]$ prior to neutralization with KOH. With an insufficient amt. of iodine, $(\text{NH}_4)_6\text{H}_4[\text{H}_2(\text{MoO}_2\text{S}_2)_3(\text{MoO}_3\text{S})_3]$ is formed.

IT 39445-46-0 42711-40-0

(ir spectrum of)

RN 39445-46-0 HCA

CN Molybdate(4-), pentaoxotritoxodi-, diammonium dihydrogen (9CI)
(CA INDEX NAME)

*** STRUCTURE DIAGRAM IS NOT AVAILABLE ***

RN 42711-40-0 HCA

CN Ammonium molybdenum hydroxide sulfide $(\text{NH}_4)_2\text{Mo}_2(\text{OH})_6\text{S}_6$, monohydrate
(9CI) (CA INDEX NAME)

CM 1

CRN 167972-27-2

CMF H4 N . H O . Mo . S

CCI TIS

CM 2

CRN 14798-03-9

CMF H4 N

NH_4^+

CM 3

CRN 14280-30-9
CMF H O

OH⁻

CM 4

CRN 7704-34-9
CMF S

S

CM 5

CRN 7439-98-7
CMF Mo

Mo

IT 42711-37-5P

(prepn. of)

RN 42711-37-5 HCA

CN Ammonium molybdenum oxide sulfide ((NH₄)₂Mo₃O₄S₆), hydrate (9CI)
(CA INDEX NAME)

CM 1

CRN 167972-26-1

CMF H₄ N . Mo . O . S

CCI TIS

CM 2

CRN 17778-80-2

CMF O

O

CM 3

CRN 14798-03-9
CMF H4 N

NH_4^+

CM 4

CRN 7704-34-9
CMF S

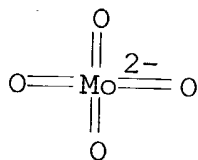
S

CM 5

CRN 7439-98-7
CMF Mo

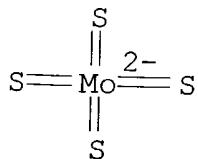
Mo

IT 13106-76-8 15060-55-6
(reaction of, with diammonium dithiomolybdate)
RN 13106-76-8 HCA
CN Molybdate (MoO_4^{2-}), diammonium, (T-4)- (9CI) (CA INDEX NAME)



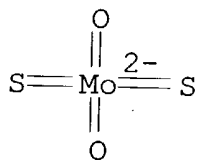
●2 NH_4^+

RN 15060-55-6 HCA
CN Molybdate(2-), tetrathio-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



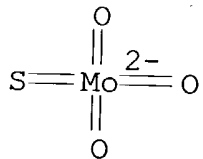
●2 NH₄⁺

IT 16150-60-0 42711-38-6 42761-49-9
 (reaction of, with hydrochloric acid)
 RN 16150-60-0 HCA
 CN Molybdate(2-), dioxodithioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

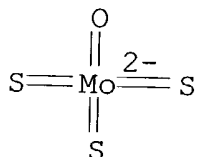
RN 42711-38-6 HCA
 CN Molybdate(2-), trioxothioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



●2 NH₄⁺

RN 42761-49-9 HCA

CN Molybdate(2-), oxotriithioxo-, diammonium, (T-4)- (9CI) (CA INDEX NAME)



● 2 NH₄⁺

CC 78-5 (Inorganic Chemicals and Reactions)
 IT 39445-45-9 **39445-46-0** 42711-39-7 **42711-40-0**
 42711-41-1
 (ir spectrum of)
 IT 39445-44-8P **42711-37-5P**
 (prepn. of)
 IT **13106-76-8 15060-55-6**
 (reaction of, with diammonium dithiomolybdate)
 IT **16150-60-0 42711-38-6 42761-49-9**
 (reaction of, with hydrochloric acid)

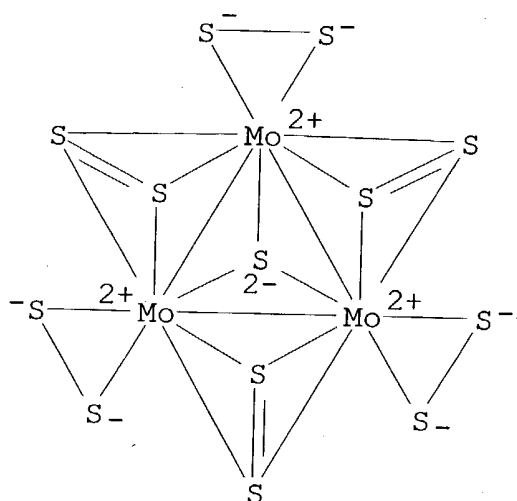
=> d 128 1-20 cbib abs hitstr hitind

L28 ANSWER 1 OF 20 HCA COPYRIGHT 2004 ACS on STN
 140:79566 Antifriction-antiwear additives consisting of trinuclear molybdenum-sulfur complexes containing little unreacted (labile) sulfur. John, Joby Varughese; Wangner, Ronald Paul; Gutierrez, Antonio; Giffin, Gregory Charles (Infineum International Limited, UK). Eur. Pat. Appl. EP 1382659 A1 20040121, 17 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, SK. (English). CODEN: EPXXDW. APPLICATION: EP 2003-253981 20030624. PRIORITY: EP 2002-78011 20020708.

AB Oil-sol. or oil-dispersible, preferably trinuclear, molybdenum-sulfur compds. as lubricating oil additives are synthesized by: (1) reacting the molybdenum compd. with a ligand source in a polar medium solvent, followed by (2) reacting a third compd. that can react with labile (i.e., **free** or **elemental**) sulfur, either with the reaction mixt. of step (1) after the reactants have begun reacting, or with the product of step (1). The molybdenum compd. in step (1) is preferably a trinuclear molybdenum compd. contg. .gtoreq.1 sulfur

atom. The product additives have a color reading of .ltoreq.5.5 (ASTM D 1500) (in white oil dispersion), contain 110 ppm Mo and 900 ppm Cl (ASTM D 6443), have a S-Mo wt. ratio of 1.45-2.25:1 (ASTM D 5185), and are more benign to metal corrosion.

- IT 67031-31-6DP, reaction products with dicoco alkyl amines (additives; antifriction-antiwear additives consisting of trinuclear molybdenum-sulfur complexes contg. little unreacted (labile) sulfur)
- RN 67031-31-6 HCA
- CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI) (CA INDEX NAME)



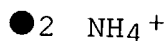
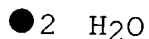
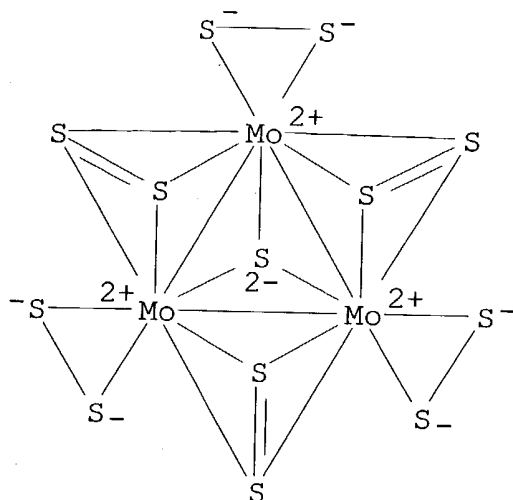
● 2 NH₄⁺

- IT 7704-34-9, Sulfur, processes (labile; antifriction-antiwear additives consisting of trinuclear molybdenum-sulfur complexes contg. little unreacted (labile) sulfur)
- RN 7704-34-9 HCA
- CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

- IC ICM C10M159-18
- ICS C07F011-00; C10M125-04; C10M135-16; C10M135-18; C10M137-10; C10N010-12; C10N030-12; C10N030-20; C10N040-25; C10N070-00

- CC 51-8 (Fossil Fuels, Derivatives, and Related Products)
IT 594-07-ODP, Dithiocarbamic acid, N,N-dicoco alkyl derivs., reaction products with trinuclear molybdenum compds. 7439-98-7DP, Molybdenum, trinuclear compds., reaction products with coco alkyl derivs. of amines and dithiocarbamates **67031-31-6DP**, reaction products with dicoco alkyl amines (additives; antifriction-antiwear additives consisting of trinuclear molybdenum-sulfur complexes contg. little unreacted (labile) sulfur)
- IT **7704-34-9**, Sulfur, processes (labile; antifriction-antiwear additives consisting of trinuclear molybdenum-sulfur complexes contg. little unreacted (labile) sulfur)
- L28 ANSWER 2 OF 20 HCA COPYRIGHT 2004 ACS on STN
138:347827 Solid-state materials and clusters. Molybdenum and tungsten clusters as aqua ions $[M_3Q_4(H_2O)_9]^{4+}$ ($M = Mo, W$; $Q = S, Se$) and related chalcogen-rich trinuclear clusters. Fedin, Vladimir P.; Sykes, A. Geoffrey; Kuppert, Dirk; Hegetschweiler, Kaspar; Appel-Colbus, Stephan; Beck, Horst Philipp (Institute of Inorganic Chemistry, Russian Academy of Sciences, Novosibirsk, 630090, Russia). Inorganic Syntheses, 33, 162-170 (English) 2002. CODEN: INSYA3. ISSN: 0073-8077. OTHER SOURCES: CASREACT 138:347827. Publisher: John Wiley & Sons, Inc..
- AB The procedures for the prepn. of incomplete cuboidal Mo and W aqua chalcogen ions $[M_3Q_4(H_2O)_9]^{4+}$ in different acids are described.
IT **383891-79-0P** (for prepn. of trinuclear molybdenum chalcogenido aqua cluster ions in different acids)
- RN 383891-79-0 HCA
CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, dihydrate (9CI) (CA INDEX NAME)



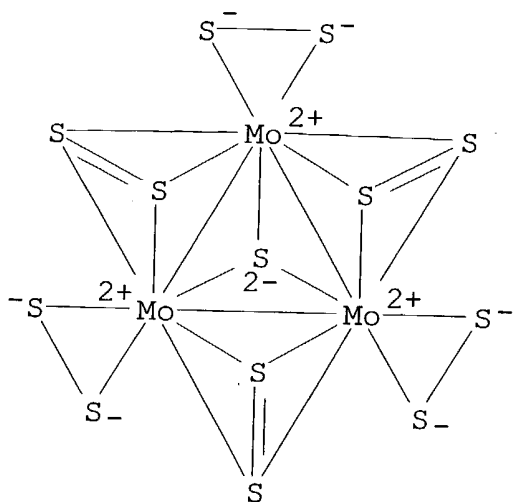
- IT 7704-34-9, Sulfur, reactions
(reactant for prepn. of trinuclear molybdenum and tungsten
chalcogenido aqua cluster ions in different acids)
- RN 7704-34-9 HCA
- CN Sulfur (8CI, 9CI) (CA INDEX NAME)
- S
- CC 78-7 (Inorganic Chemicals and Reactions)
- IT 37354-79-3P 37354-80-6P 127294-35-3P **383891-79-0P**
(for prepn. of trinuclear molybdenum chalcogenido aqua cluster
ions in different acids)
- IT 7704-34-9, Sulfur, reactions 7782-49-2, Selenium,
reactions 9080-17-5, Ammonium polysulfide
(reactant for prepn. of trinuclear molybdenum and tungsten
chalcogenido aqua cluster ions in different acids)
- L28 ANSWER 3 OF 20 HCA COPYRIGHT 2004 ACS on STN
- 135:291064 Lubricant compositions comprising organic molybdenum
complexes. Mcconnachie, Jonathan Martin; Bell, Ian Alexander
Weston; Brown, Alisdair James; Stiefel, Edward Ira; Hill, Ernestine
W. (Infineum International Ltd., UK). Eur. Pat. Appl. EP 1138752 A1
20011004, 13 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR,
GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO.

(English). CODEN: EPXXDW. APPLICATION: EP 2001-106336 20010315.
 PRIORITY: EP 2000-201137 20000329.

- AB A lubricating oil compn. is provided comprising a major amt. of an oil of lubricating viscosity and a minor amt. of, as an additive, at least one compd. comprising a polynuclear molybdenum core and bonded thereto one or more anionic ligands capable of rendering the compd. oil-sol. or oil-dispersible, wherein the ratio of the no. of molybdenum atoms in the core to the no. of said ligands is 1:1, such as 3:2 or greater. ~.
- IT **7704-34-9**, Sulfur, miscellaneous
 (lubricant compns. comprising org. molybdenum complexes)
- RN 7704-34-9 HCA
- CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

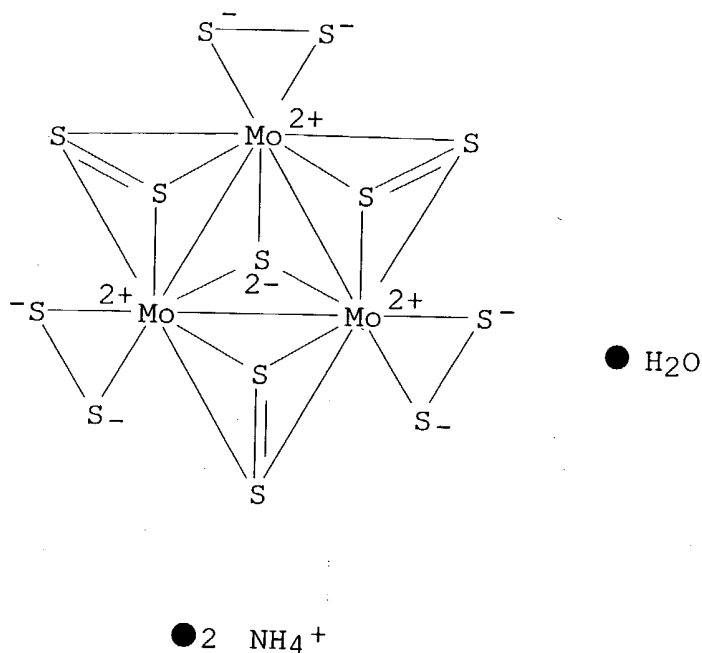
- IT **67031-31-6**
 (lubricant compns. comprising org. molybdenum complexes)
- RN 67031-31-6 HCA
- CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
 (CA INDEX NAME)



● 2 NH₄⁺

- IC ICM C10M159-18
 ICS C07F011-00

- ICI C10N010-12, C10N030-06, C10N040-25
CC 51-8 (Fossil Fuels, Derivatives, and Related Products)
IT 7704-34-9, Sulfur, miscellaneous
(lubricant compns. comprising org. molybdenum complexes)
IT 67-56-1, Methanol, reactions 75-15-0, Carbon disulfide, reactions
1120-48-5, Dioctylamine 67031-31-6
(lubricant compns. comprising org. molybdenum complexes)
- L28 ANSWER 4 OF 20 HCA COPYRIGHT 2004 ACS on STN
134:313320 Supported molybdenum-sulfur cluster compounds as precursors
for HDS catalysts. Fedin, V. P.; Czyzniewska, J.; Prins, R.; Weber,
T. (Laboratory for Technical Chemistry, Swiss Federal Institute of
Technology (ETH), Zurich, 8092, Switz.). Applied Catalysis, A:
General, 213(1), 123-132 (English) 2001. CODEN: ACAGE4. ISSN:
0926-860X. Publisher: Elsevier Science B.V..
- AB The catalytic activity in the hydrodesulfurization (HDS) of
thiophene at 370.degree.C was investigated on ex complex catalysts
made from the ammonium and sodium, cobalt, and nickel salts of the
[Mo3S13]2- cluster anion supported on .gamma.-Al2O3 or SiO2 and
compared with that of a classic NiMo/Al2O3 catalyst. Samples were
characterized by IR, Raman, UV/VIS, and thermogravimetric
measurements. The samples were activated in He at 110 or
400.degree.C, and H2S/H2 (10% of H2S in H2) was
introduced at room temp., 110 or 400.degree.C. Furthermore, the
NiMo/Al2O3 catalyst was activated directly from room temp. to
400.degree.C in H2S/H2. The initial sulfidation temp.
(400.degree.C or room temp.) did not influence the activity of the
ex complex catalysts, whereas the classic NiMo/Al2O3 catalyst was
very sensitive to the initial temp. of the sulfidation. The sample
treated at 400.degree.C and sulfided starting at room temp.
exhibited a much higher activity than the sample to which
H2S/H2 was added at 400.degree.C. Thermal treatment of the
catalyst in He at 110.degree.C as opposed to 400.degree.C led to a
lower activity of the ex complex catalysts and to a higher activity
of the NiMo/Al2O3 catalyst. Catalyst samples made from
Na2[Mo3S13].cntdot.5H2O/Al2O3 were slightly less active than the
samples obtained from (NH4)2[Mo3S13].cntdot.H2O/Al2O3.
- IT 138952-15-5
(supported molybdenum-sulfur cluster compds. as precursors for
hydrodesulfurization catalysts)
- RN 138952-15-5 HCA
CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kapp
a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium,
monohydrate (9CI) (CA INDEX NAME)



CC 51-6 (Fossil Fuels, Derivatives, and Related Products)

IT 138952-15-5

(supported molybdenum-sulfur cluster compds. as precursors for hydrosulfurization catalysts)

L28 ANSWER 5 OF 20 HCA COPYRIGHT 2004 ACS on STN

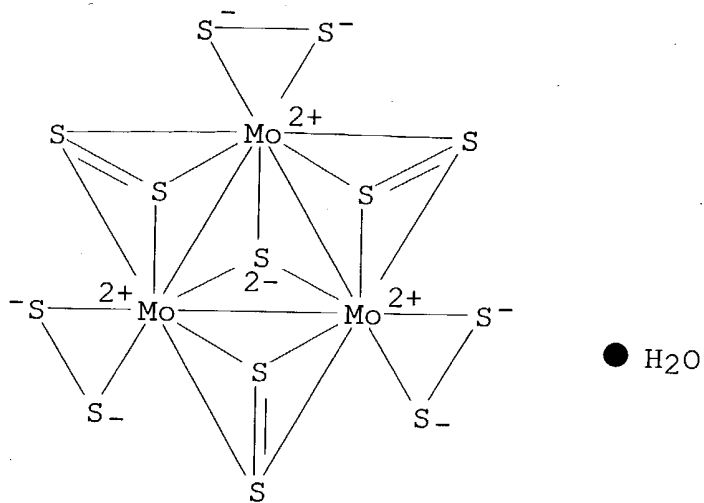
130:354538 Direct liquefaction of Wyodak coal using molybdenum sulfides as well as vanadium and tungsten-vanadium phosphomolybdates as catalyst precursors. Van Woert, Howard C., Jr.; Givens, Edwin N.; Lafferty, C. J. (Center for Applied Energy Research, University of Kentucky, Lexington, KY, 40511-8410, USA). Preprints - American Chemical Society, Division of Petroleum Chemistry, 44(2), 202-205 (English) 1999. CODEN: ACPCAT. ISSN: 0569-3799. Publisher: American Chemical Society, Division of Petroleum Chemistry.

AB Direct liquefaction of Wyodak (subbituminous) coal using Mo catalysts was examd. at 440.degree. and 1000 psig, using as Mo precursors ammonium tetrathiomolybdate, ammonium dioxodithiomolybdate, (NH₄)₂Mo₃S₁₃.H₂O, (NH₄)₂Mo₂S₁₂.2H₂O, molybdovanadophosphoric acid, and tungstovanadophosphomolybdic acid. Coal conversions (both to THF-sol. material and conversions of residues) were all sensitive to the amt. of added H₂S during liquefaction, suggesting that the presence of the sulfide source was necessary to form active Mo-S sites.

IT 138952-15-5

(molybdenum source; molybdenum-catalyzed direct liquefaction of

Wyodak subbituminous coal with different molybdenum sources)
 RN 138952-15-5 HCA
 CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, monohydrate (9CI) (CA INDEX NAME)



● 2 NH₄⁺

IT 7783-06-4, **Hydrogen sulfide**, uses
 (sulfiding agent; molybdenum-catalyzed direct liquefaction of
 Wyodak subbituminous coal with different molybdenum sources)
 RN 7783-06-4 HCA
 CN Hydrogen sulfide (H₂S) (8CI, 9CI) (CA INDEX NAME)

H₂S

CC 51-21 (Fossil Fuels, Derivatives, and Related Products)
 IT 12293-21-9 15060-55-6, Diammonium tetrathiomolybdate 16150-60-0
 65878-95-7 138952-15-5
 (molybdenum source; molybdenum-catalyzed direct liquefaction of
 Wyodak subbituminous coal with different molybdenum sources)
 IT 7783-06-4, **Hydrogen sulfide**, uses
 (sulfiding agent; molybdenum-catalyzed direct liquefaction of
 Wyodak subbituminous coal with different molybdenum sources)

L28 ANSWER 6 OF 20 HCA COPYRIGHT 2004 ACS on STN
 124:104599 Hydrothermal synthesis of a novel Sel₂ ring in

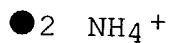
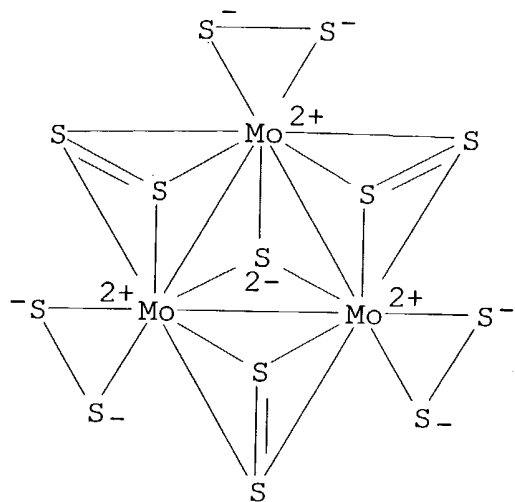
[{(NH₄)₂[Mo₃S_{11.72}Se_{1.28}]}[Se₁₂]]. Stevens, Richard A.; Raymond, Casey C.; Dorhout, Peter K. (Dep. Chem., Colorado State Univ., Fort Collins, CO, 80523, USA). Angewandte Chemie, International Edition in English, 34(22), 2509-11 (English) 1995. CODEN: ACIEAY. ISSN: 0570-0833. Publisher: VCH.

AB The hydrothermal reaction of (NH₄)₂MoS₄ with A₂S_x (A = Na, K; x = 2-6) resulted in the formation of (NH₄)₂[Mo₃S₁₃] [monoclinic, space group Pm]. Replacing the polysulfide with A₂Se_x (A = Na, K; x = 2-4) gave Se, Mo and some sol. polychalcogenides. Na₂S₃Se₃, prepd. from the elements, reacted with (NH₄)₂MoS₄ to give [(NH₄)₂[Mo₃S_{11.72}Se_{1.28}]}[Se₁₂]] (I). I crystals are trigonal, space group P.hivin.3c1, Z = 3, R = 0.0401, R_w = 0.0975. Double layers of trinuclear Mo clusters of [Mo₃S_{11.72}Se_{1.28}]₂- encircle D_{3d} rings of Se₁₂.

IT 7704-34-9, Sulfur, reactions
(for prepn. of sodium selenide sulfide)
RN 7704-34-9 HCA
CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

IT 67031-31-6P 172666-10-3DP, solid soln. with
selenoxomolybdate analog, preparation
(prepn. and crystal structure of)
RN 67031-31-6 HCA
CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa
a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)

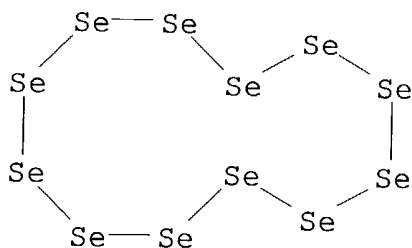


RN 172666-10-3 HCA
 CN Molybdate(2-), tris[.mu.-(disulfur-S,S':S,S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, compd. with mol. selenium (Se12) (1:1) (9CI) (CA INDEX NAME)

CM 1

CRN 78112-19-3

CMF Se12

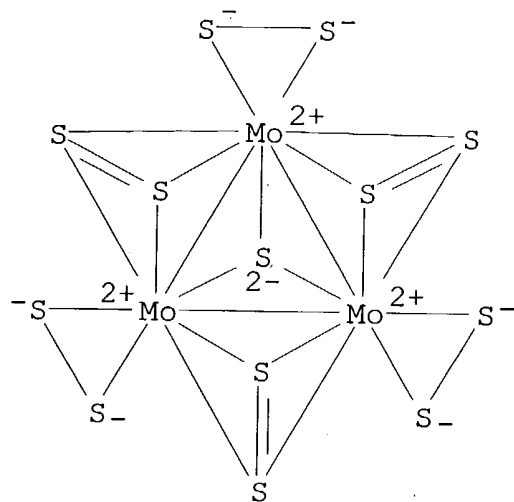


CM 2

CRN 67031-31-6

CMF H4 N . 1/2 Mo3 S13

CCI CCS



● 2 NH₄⁺

- CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75
- IT 7440-23-5, Sodium, reactions **7704-34-9**, Sulfur, reactions
7782-49-2, Selenium, reactions
(for prepn. of sodium selenide sulfide)
- IT **67031-31-6P** 172666-08-9DP, solid soln. with
thioxomolybdate analog, preparation **172666-10-3DP**, solid
soln. with selenoxomolybdate analog, preparation
(prepn. and crystal structure of)
- L28 ANSWER 7 OF 20 HCA COPYRIGHT 2004 ACS on STN
- 124:61002 Sulfidation study of molybdenum oxide using MoO₃/SiO₂/Si(100)
model catalysts and Mo^{3IV}-sulfur cluster compounds. Muijsers, J.
C.; Weber, Th.; van Hardeveld, R. M.; Zandbergen, H. W.;
Niemantsverdriet, J. W. (Schuit Institute Catalysis, Eindhoven
University Technology, Eindhoven, 5600 MB, Neth.). Journal of
Catalysis, 157(2), 698-705 (English) 1995. CODEN: JCTLA5. ISSN:
0021-9517. Publisher: Academic.
- AB Monochromatic XPS spectra of the temp.-dependent sulfidation of
MoO₃/SiO₂/Si(100) model catalysts were compared with spectra of
model Mo-S cluster compds., esp. with those of
(NH₄)₂[Mo₃S₁₃].cntdot.H₂O and its thermal decompn. products. XPS
was used to identify different states of sulfur and molybdenum
occurring during sulfidation. The spectra showed the presence of
bridging disulfide ligands and of substantial amts. of Mo^V in an

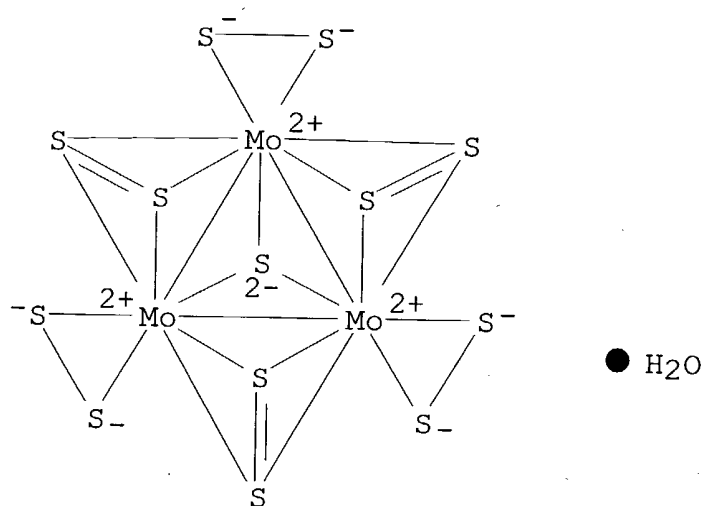
early stage of the sulfidation. These findings suggest that the initial reaction of the MoO₃-type precursor with the H₂S/H₂ atmosphere consists of two elementary steps, namely, an O-S exchange followed by a Mo-S redox process.

IT 138952-15-5

(ref. compd.; mechanism of and cluster formation in sulfidation of Mo-contg. compds. as ref. hydrodesulfurization catalysts)

RN 138952-15-5 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, monohydrate (9CI) (CA INDEX NAME)



● 2 NH₄⁺

CC 51-11 (Fossil Fuels, Derivatives, and Related Products)

Section cross-reference(s): 29, 67, 78

IT 1313-27-5, Molybdenum trioxide, uses 97278-54-1 129771-07-9
138952-15-5

(ref. compd.; mechanism of and cluster formation in sulfidation of Mo-contg. compds. as ref. hydrodesulfurization catalysts)

L28 ANSWER 8 OF 20 HCA COPYRIGHT 2004 ACS on STN

119:151081 Molybdenum(IV) sulfide-disulfide complex ([MoIV₃S(S₂)₆]²⁻) from amorphous molybdenum trisulfide by the reaction with hydroxide and R = 0.015 structure of (NH₄)₂[MoIV₃S(S₂)₆].H₂O. Mueller, A.; Diemann, E.; Krickemeyer, E.; Walberg, H. J.; Boegge, H.; Armatage, A. (Fak. Chem., Univ. Bielefeld, Bielefeld, D-W-4800/1, Germany). European Journal of Solid State and Inorganic Chemistry, 30(5),

565-72 (English) 1993. CODEN: EJSCE5. ISSN: 0992-4361.

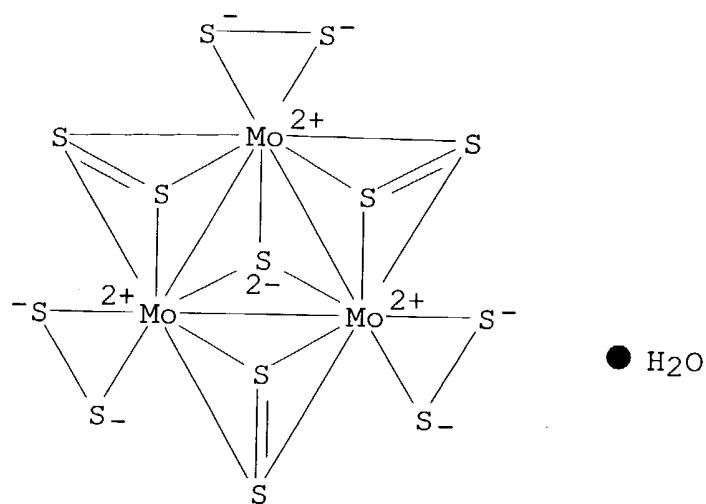
AB A refined crystal structure detn. ($R = 0.015$) of $(\text{NH}_4)_2[\text{Mo}_3\text{S}_{13}]\cdot\text{H}_2\text{O}$ including H-atom positions of the NH_4^+ ions is reported. The formation of the cluster anion $[\text{Mo}_3\text{S}_{13}]^{2-}$ from amorphous MoS_3 , suspended in O_2 -free aq. NH_3 soln. at room temp., is described. This observation is discussed in terms of triangular sulfide and disulfide bridged Mo_3 units regarded as structural features in the amorphous educt.

IT **138952-15-5P**

(prepn. and crystal structure of)

RN 138952-15-5 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, monohydrate (9CI) (CA INDEX NAME)



● 2 NH_4^+

CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

IT **138952-15-5P**

(prepn. and crystal structure of)

L28 ANSWER 9 OF 20 HCA COPYRIGHT 2004 ACS on STN

117:61622 Reactivity of triangular $\text{M}_3\text{Z}_7^{4+}$ (M = molybdenum, tungsten; Z = sulfur, selenium) complexes and x-ray structural study $(\text{NH}_4)_2\text{W}_3(\mu_3\text{-S})(\mu_2\text{-S})_3(\text{S}_4)_3(\text{NH}_3)_3\cdot\text{H}_2\text{O}$. Fedin, V. P.; Sokolov, M. N.; Kibirev, O. S.; Virovets, A. V.; Podberezskaya, N. V.; Fedorov, V. E. (Inst. Neorg. Khim., Novosibirsk, USSR). Zhurnal

Neorganicheskoi Khimii, 36(12), 3089-95 (Russian) 1991. CODEN:
ZNOKAQ. ISSN: 0044-457X.

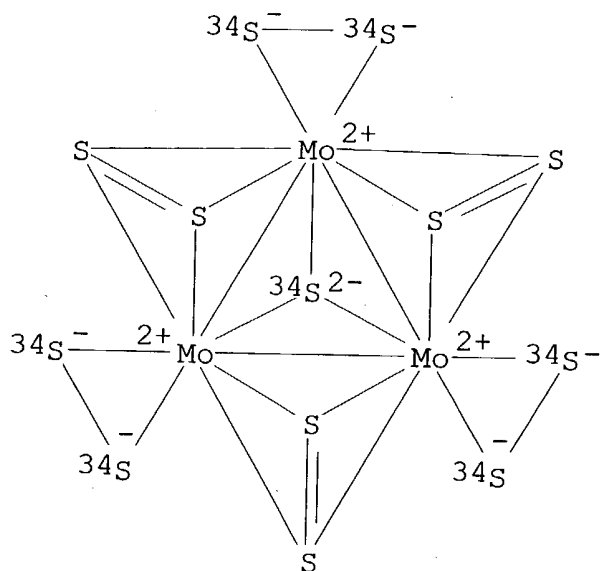
AB During the reaction of $(\text{Et}_4\text{N})_2\text{Mo}_3\text{S}_7\text{Br}_2$ (I) with $(\text{NH}_4)_2\text{S}_x$, satd. with S, and with Cp_2TiS_5 (Cp = cyclopentadienyl), the $\text{Mo}_3\text{S}_7^{4+}$ core is retained to give $[\text{Mo}_3\text{S}_7(\text{S}_2)_3]^{2-}$. I reacted with $\text{NaS}_2\text{CNEt}_2$ to give $\text{Mo}_3\text{S}_7(\text{S}_2\text{CNEt}_2)_4$. The reaction of $(\text{Et}_4\text{N})_2\text{Mo}_3\text{Se}_7\text{Br}_6$ with KSCN gave $(\text{Et}_4\text{N})_2\text{Mo}_3\text{Se}_7(\text{NCS})_6$. $\text{W}_3\text{Se}_7\text{Br}_4$ reacted with $(\text{NH}_4)_2\text{S}_x$ to give $(\text{NH}_4)_2\text{W}_3\text{S}_{16}(\text{NH}_3)_3 \cdot \text{H}_2\text{O}$ (II) and with KSCN to give $(\text{Et}_4\text{N})_2\text{W}_3\text{S}_4(\text{NCS})_9$. $\text{Mo}_3\text{Se}_7\text{Br}_4$ reacted with $(\text{NH}_4)_2\text{S}_x$ in H_2O at 150.degree. to give $(\text{NH}_4)_2\text{Mo}_3\text{S}_{13}$ and subsequently $(\text{Et}_4\text{N})_2\text{Mo}_3\text{S}_7\text{Br}_6$ after treatment with Et_4NBr . Thermolysis of II gave $(\text{Et}_4\text{N})_2\text{W}_2\text{S}_2(\mu\text{-S})_2(\text{S}_4)_2$. II is trigonal, space group $P3/c$, a 12.425(2), c 10.109(1) .ANG., $Z = 2$, $R = 0.059$, $R_f = 0.0649$. The W_3 triangular cluster anion in II has 1 $\mu\text{-S}$ atom, 3 $\mu\text{-S}$ atoms, and 4 S_4^{2-} moieties each coordinated bidentately to 1 W atom. An NH_3 ligand is on each W atom.

IT 139594-43-7P

(prepn. of)

RN 139594-43-7 HCA

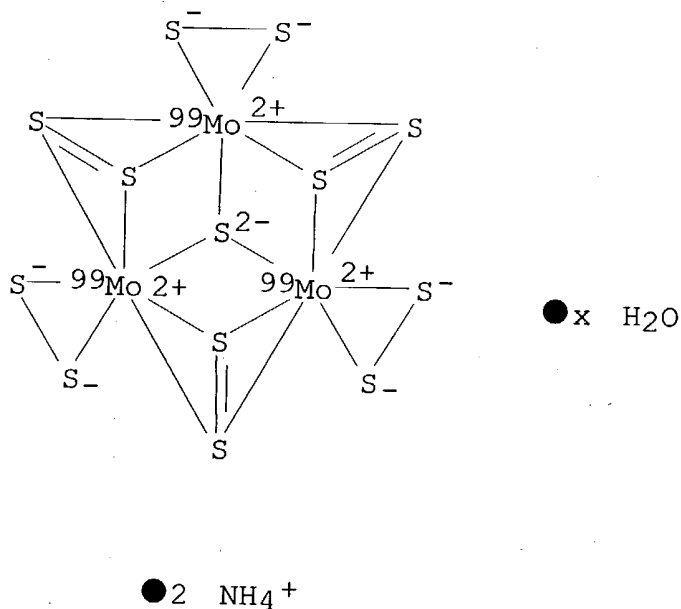
CN Molybdate(2-), tris[$\mu\text{-}(\text{disulfur-}\kappa\text{S}, \kappa\text{S}':\kappa\text{S}, \kappa\text{S}'')\text{tris}(\text{dithio-34S}_2)\text{-}\mu\text{-3-thioxo-34S-tri-}, \text{triangulo, diammonium}$ (9CI) (CA INDEX NAME)



● 2 NH_4^+

CC 78-9 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

- IT 147-84-2DP, molybdenum complex 7439-98-7DP, Molybdenum, complex
with diethyldithiocarbamic acid 131836-26-5P 139353-16-5P
139383-09-8P **139594-43-7P**
(prepn. of)
- L28 ANSWER 10 OF 20 HCA COPYRIGHT 2004 ACS on STN
- 116:206642 Nuclear quadrupole interaction of molybdenum-99(.beta.-
)technetium-99 in various molybdenum sulfur cluster compounds and
thermal decomposition products of $((\text{NH}_4)_2[\text{Mo}_3\text{S}(\text{S}_2)_6] \cdot n\text{H}_2\text{O}$ ($n =$
 $0-2$)). Mottner, P.; Lerf, A.; Butz, T.; Knoezinger, H.; Mueller,
A.; Wittneben, V.; Krickemeyer, E. (Walther-Meissner-Inst.
Tiefteperaturforsch., Bayer. Akad. Wiss., Garching, W-8046,
Germany). Chemical Physics, 160(2), 327-39 (English) 1992. CODEN:
CMPHC2. ISSN: 0301-0104.
- AB The nuclear quadrupole interaction (NQI) of $^{99}\text{Mo}(.beta.-)^{99}\text{Tc}$ was
measured by time differential perturbed angular correlations in the
following Mo-S-cluster compds. and ions: $(\text{NH}_4)_2[\text{MoIV}_3\text{S}(\text{S}_2)_6] \cdot n\text{H}_2\text{O}$ ($n =$
 $0-2$), $[\text{MoIV}_3\text{SS}_3(\text{CN})_9]^{5-}$, $(\text{NH}_4)_2[\text{MoV}_2(\text{S}_2)_6] \cdot 2\text{H}_2\text{O}$, and
 $[\text{MoIII}_2\text{S}_2(\text{CN})_8]^{6-}$. All compds. exhibit low NQIs with the exception
of $(\text{NH}_4)_2[\text{MoIV}_3\text{S}(\text{S}_2)_6] \cdot n\text{H}_2\text{O}$ which shows in addn. to the low NQI a
large fraction of a high NQI, possibly a consequence of the nuclear
transmutation. The thermal decompn. products of the $[\text{Mo}_3\text{S}(\text{S}_2)_6]^{2-}$
cluster towards MoS_2 , which may serve as a model for tech.
hydrodesulfurization catalysts, were studied.
- IT **140684-11-3P**
(prepn. and nuclear quadrupole interactions and thermal decompn.
and reaction of, with potassium cyanide)
- RN 140684-11-3 HCA
- CN Molybdate(2-)- ^{99}Mo , tris[.mu.-(disulfur-S,S':S,S')]tris(dithio)-
.mu.3-thioxotri-, diammonium, hydrate (9CI) (CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 70

IT **140684-11-3P**

(prepn. and nuclear quadrupole interactions and thermal decompn. and reaction of, with potassium cyanide)

L28 ANSWER 11 OF 20 HCA COPYRIGHT 2004 ACS on STN

116:98146 Studies on the triangular [molybdate-disulfido-sulfido] cluster [Mo₃S₁₃]²⁻: electronic structure (X.alpha. calculations, XPS), crystal structure of (Ph₄As)₂[Mo₃S₁₃].2CH₃CN and a refinement of the crystal structure of (NH₄)₂[Mo₃S₁₃].H₂O. Mueller, A.; Wittneben, V.; Krickemeyer, E.; Boegge, H.; Lemke, M. (Fak. Chem., Univ. Bielefeld, Bielefeld, W-4800/1, Germany). Zeitschrift fuer Anorganische und Allgemeine Chemie, 605, 175-88 (English) 1991. CODEN: ZAACAB. ISSN: 0044-2313.

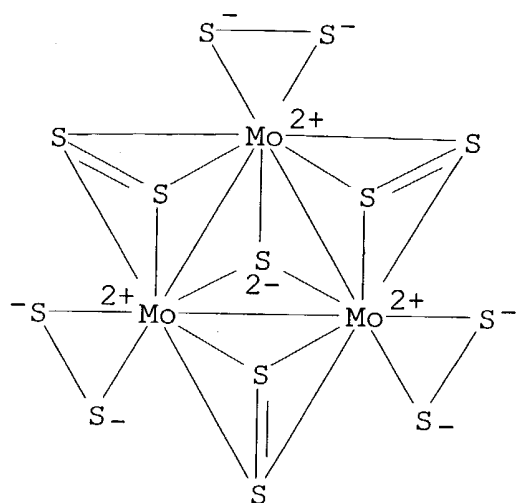
AB The electronic structure of the triangular thio cluster [Mo₃S₁₃]²⁻ has been studied by electronic absorption and XPS and is discussed in terms of SCF-X.alpha.-SW calcns. The synthesis and crystal structure of (Ph₄As)₂[Mo₃S₁₃].2CH₃CN (I), which is sol. in org. solvents, are reported together with a refinement of the crystal structure of (NH₄)₂[Mo₃S₁₃].H₂O (II). Crystal data: I, triclinic, space group P.hivin.1, Z = 2, R/Rw = 0.078/0.082; II, monoclinic, space group Cm, Z = 2, R/Rw = 0.038/0.045.

IT **138766-18-4P**

(prepn. and crystal structure and XPS of)

RN 138766-18-4 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-S,S':S,S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, hydrate (2:1) (9CI) (CA INDEX NAME)



● 1/2 H₂O

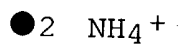
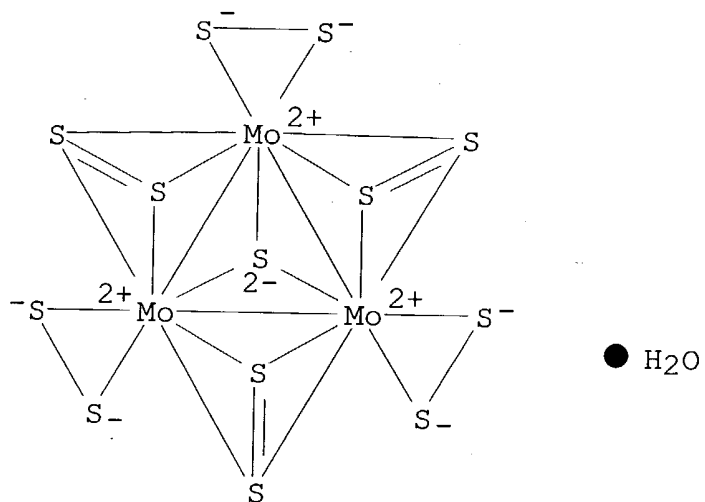
● 2 NH₄⁺

IT 138952-15-5P

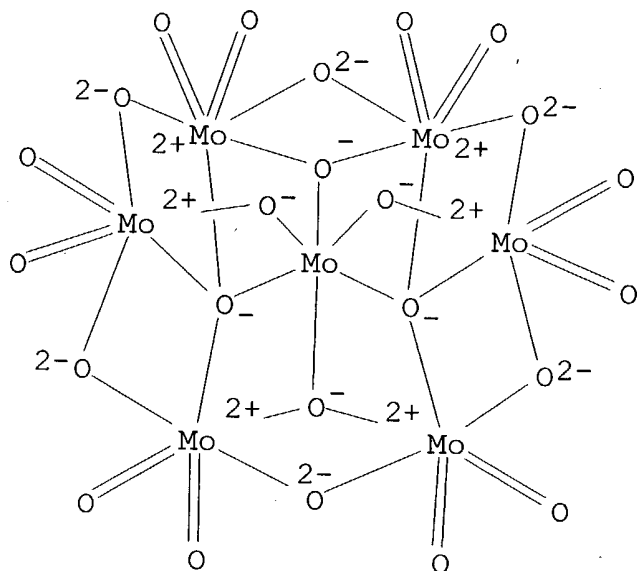
(prepn. and crystal structure and cation exchange and XPS of)

RN 138952-15-5 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, monohydrate (9CI) (CA INDEX NAME)



IT 12027-67-7
 (reaction of, with polysulfide)
 RN 12027-67-7 HCA
 CN Molybdate (Mo7O246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH₄⁺

CC 78-7 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 73, 75

IT 103601-59-8P **138766-18-4P**

(prepn. and crystal structure and XPS of)

IT **138952-15-5P**

(prepn. and crystal structure and cation exchange and XPS of)

IT **12027-67-7**

(reaction of, with polysulfide)

L28 ANSWER 12 OF 20 HCA COPYRIGHT 2004 ACS on STN

115:246596 Preparation of complexes containing the [Mo₃S(S₂)₃]⁴⁺ core and structure of tris(diethyldithiocarbamato)tris(.mu.-disulfido)(.mu.₃-thio)-triangulo-trimolybdenum(IV) iodide.

Zimmermann, Heinrich; Hegetschweiler, Kaspar; Keller, Thomas; Gramlich, Volker; Schmalte, Helmut W.; Petter, Walter; Schneider, Walter (Lab. Anorg. Chem., ETH-Zent., Zurich, CH-8092, Switz.). Inorganic Chemistry, 30(23), 4336-41 (English) 1991. CODEN: INOCAJ. ISSN: 0020-1669.

AB [Mo₃S(S₂)₃(dtc)3]I, [Mo₃S(S₂)₃(tpy)3]I, and [Mo₃S(S₂)₃(tpy)₂(dtc)]I (Hdte = diethyldithiocarbamic acid, Htpy = 2-thiopyridine) were prepd. by the oxidn. of the terminal disulfido groups of [Mo₃S(S₂)₆]²⁻ with disulfides. The influence of the redox potential of the oxidant on the reaction rate is discussed.

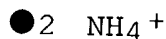
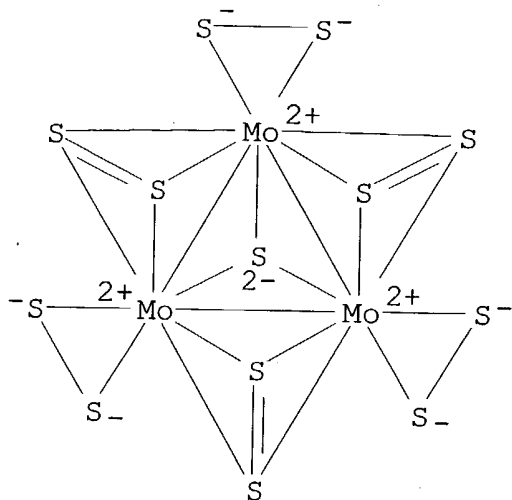
[Mo₃S(S₂)₃(oxq)₃]Br⁻ (Hoxq = 8-hydroxyquinoline), (PPh₄)₂[Mo₃S(S₂)₃(cat)₃] (H₂cat = o-catechol) and [Mo₃S(S₂)₃(dtc)₃]X (X = I, Br) were obtained by the substitution of Br in [Mo₃S(S₂)₃Br₆]²⁻. Two types of crystals of the polymorphous [Mo₃S(S₂)₃(dtc)₃]I have been analyzed by x-ray diffraction, modification 1 with space group Aba2, Z = 8, a 24.92(1), b 17.93(1), c 16.56(1) .ANG. and modification 2 with space group Iba2, Z = 8, a 17.761(3), b 24.281(4), and c 16.74(1) .ANG.. In both crystals, a weak binding of I to the 3 axial S atoms of the complex was found, with av. distance I-S = 3.30 (modification 1) and 3.25 .ANG. (modification 2). According to similar structures described in literature, a general anionic binding site of [Mo₃S(S₂)₃] is postulated. In the FAB mass spectrum of [Mo₃S(S₂)₃(tpy)₂(dtc)] a redistribution of ligands was indicated by the signals of [Mo₃S(S₂)₃(tpy)_x(dtc)_y] (3 .gtoreq. x .gtoreq. 1, 2 .gtoreq. y .gtoreq. 0). On the other hand, no dissocn. of dtc has been detected in solns. of [Mo₃S₇(dtc)₃]I at room temp. by NMR spectroscopy. However, the signals of the free Hoxq and H₂cat, as obsd. in the ¹H NMR spectrum of [Mo₃S₇(oxq)₃]⁺ and [Mo₃S₇(cat)₃]²⁻, indicated more labile Mo-N and Mo-O bonds compared to the Mo-S bond in the dtc complex.

IT 67031-31-6P

(prepn. and oxidn. of, by dithiocarbamate or thiopyridine)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)

IT 67031-31-6P

(prepn. and oxidn. of, by dithiocarbamate or thiopyridine)

L28 ANSWER 13 OF 20 HCA COPYRIGHT 2004 ACS on STN

113:16894 Triangular thio complexes of molybdenum: reactions with halogens, hydrohalogen acids and phosphines. Fedin, V. P.; Sokolov, M. N.; Mironov, Yu. V.; Kolesov, B. A.; Tkachev, S. V.; Fedorov, V. E. (Inst. Inorg. Chem., Novosibirsk, 630090, USSR). Inorganica Chimica Acta, 167(1), 39-45 (English) 1990. CODEN: ICHAA3. ISSN: 0020-1693.

AB Triangular (NH₄)₂Mo₃S₁₃·2H₂O interacts with Cl₂ and Br₂ in CH₃CN and with HX (X = Cl, Br and I) retaining its Mo₃(.mu.₃-S)(.mu.₂-S₂)₃⁴⁺ cluster fragment to produce the Mo₃(.mu.₃-S)(.mu.₂-S₂)₃X₆²⁻ complexes in high yields. IR and Raman spectra of the Mo₃S₇X₆²⁻ complexes have been studied. Salts of Mo₃S₇X₆²⁻ (X = Cl, Br) contg. ⁹²Mo, ¹⁰⁰Mo and ³⁴S isotopes and compds. with .mu.₂-(³²S-³⁴S) ligands have been synthesized also. For Mo₃S₇Cl₆²⁻, an anal. of the normal vibrations has been performed. Mo₃S₇X₆²⁻ (X = Cl, Br) interact with phosphines (PPh₃ and dppe). The reactions proceed with elimination of the .mu.₂-S₂ S atoms to form phosphine sulfides and Mo₃S₄X₄·3PPh₃ and Mo₃S₄X₄·3dppe contg. a Mo₃S₄⁴⁺ cluster fragment. For the reaction of Mo₃(.mu.₃-³⁴S)(.mu.₂-³²Se-³⁴Sa)3Cl₆²⁻ with PPh₃, that it is the equatorial .mu.₂-S₂ S atoms that are predominantly eliminated.

IT 13965-97-4, Sulfur-34, properties
(isotope effect of, on vibrational spectra of molybdenum chloro
sulfido trinuclear clusters)

RN 13965-97-4 HCA

CN Sulfur, isotope of mass 34 (8CI, 9CI) (CA INDEX NAME)

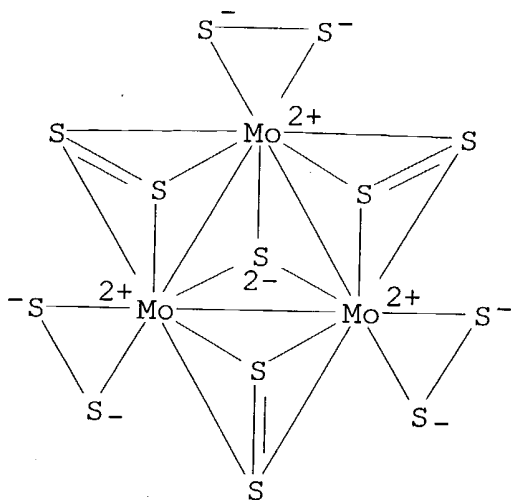
34S

IT 67031-31-6

(reaction of, with halides and hydrohalic acids with and without
ammonium or phosphonium halides)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa
a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



● 2 NH₄⁺

CC 78-7 (Inorganic Chemicals and Reactions)

Section cross-reference(s): 73

IT 13965-97-4, Sulfur-34, properties 14191-67-4,
Molybdenum-92, properties 14392-21-3, Molybdenum-100, properties
(isotope effect of, on vibrational spectra of molybdenum chloro
sulfido trinuclear clusters)

IT 67031-31-6

(reaction of, with halides and hydrohalic acids with and without
ammonium or phosphonium halides)

L28 ANSWER 14 OF 20 HCA COPYRIGHT 2004 ACS on STN

112:228559 Synthesis and vibrational (IR and Raman) spectroscopic study of triangular thio complexes $[\text{Mo}_3\text{S}_{13}]^{2-}$ containing molybdenum-92, molybdenum-100 and sulfur-34. Fedin, V. P.; Kolesov, B. A.; Mironov, Yu. V.; Fedorov, V. Ye. (Inst. Inorg. Chem., Novosibirsk, 630090, USSR). Polyhedron, 8(20), 2419-23 (English) 1989. CODEN: PLYHDE. ISSN: 0277-5387.

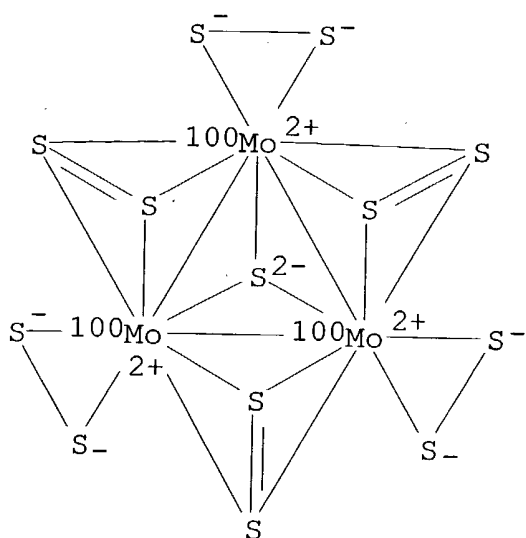
AB Triangular $[\text{Mo}_3\text{S}_{13}]^{2-}$ was obtained by the reaction of triangular $\text{Mo}_3\text{S}_7\text{Br}_4$ with an aq. soln. of S^{2-} . Starting from compds. contg. ^{92}Mo , ^{100}Mo and ^{34}S isotopes, the following thio-complexes have been obtained: $[\text{Mo}_3\text{S}_{13}]^{2-}$, $[\text{Mo}_3\text{S}_{13}]^{2-}$, $[\text{Mo}_3\text{S}_{13}]^{2-}$, $[\text{Mo}_3(\mu_3\text{-S})(\mu_2\text{-S}_3\text{S})_3(\text{S}_2)_3]^{2-}$ and $[\text{Mo}_3(\mu_3\text{-S}_3\text{S})_3(\text{S}_2)_3]^{2-}$. Along with the nucleophilic substitution of the Br ligands by the terminal S_2 ligands, elimination-addn. of S in $\mu_2\text{-S}_2$ ligands also takes place. This allows prepn. of thio-complexes contg. $\mu_2\text{-S}_3\text{S}_2\text{S}$ ligands. IR and Raman spectra of the thio-complexes have been studied, normal vibrations have been calcd. and the bond force consts. detd.

IT 127161-24-4P

(prepn. and force const. and vibrational spectra of)

RN 127161-24-4 HCA

CN Molybdate(2-)- ^{100}Mo , tris[$\mu_3\text{-(disulfur-S,S':S,S')}$]tris(dithio)- $\mu_3\text{-thioxotri-}$, triangulo, diammonium, dihydrate (9CI) (CA INDEX NAME)



● 2 H_2O

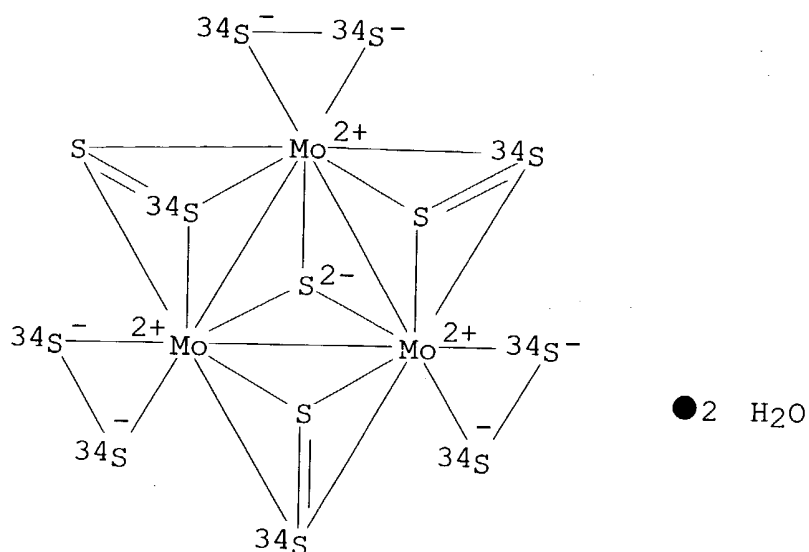
● 2 NH_4^+

IT 127161-22-2P 127161-23-3P 127211-93-2P
127277-35-4P

(prepn. and force consts. and vibrational spectra of)

RN 127161-22-2 HCA

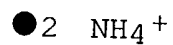
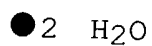
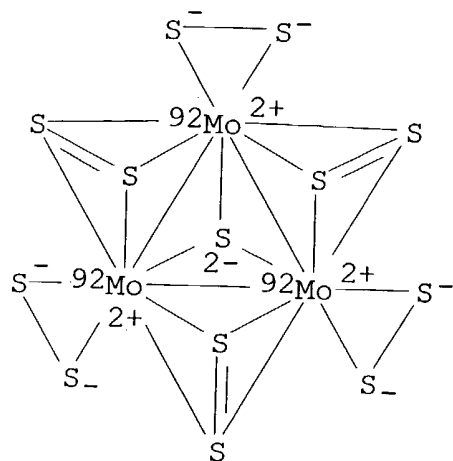
CN Molybdate(2-), tris[.mu.-[(disulfur-34S)-S,S':S,S']]tris(dithio-34S2)-.mu.3-thioxotri-, triangulo, diammonium, dihydrate (9CI) (CA INDEX NAME)



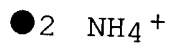
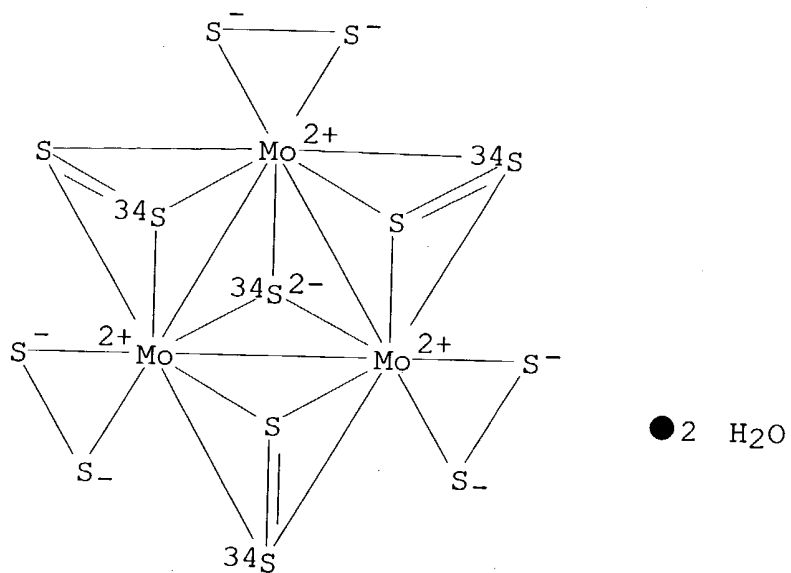
●2 NH₄⁺

RN 127161-23-3 HCA

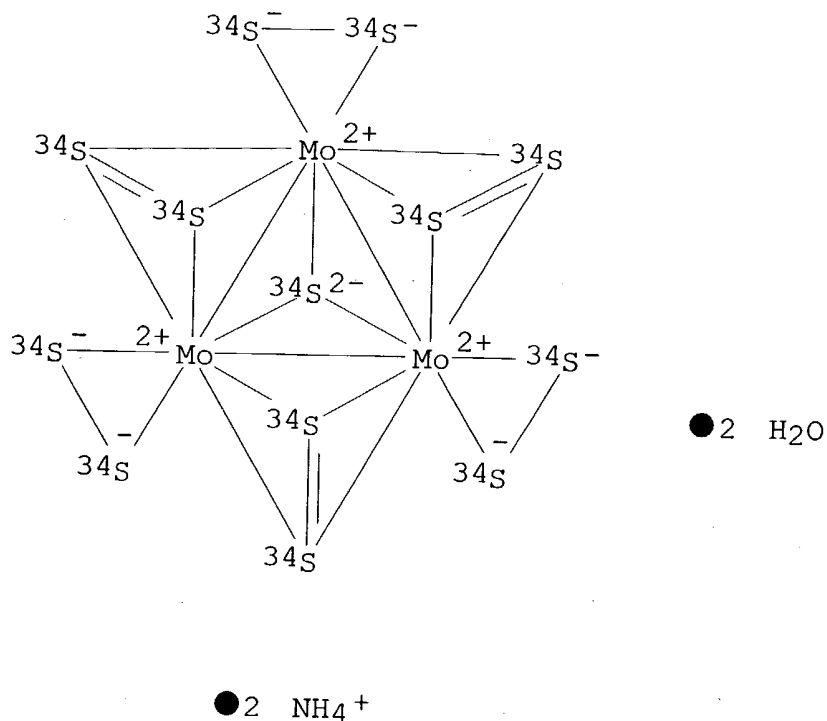
CN Molybdate(2-)-92Mo, tris[.mu.-[(disulfur-S,S':S,S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium, dihydrate (9CI) (CA INDEX NAME)



RN 127211-93-2 HCA
 CN Molybdate(2-), tris[.mu.-[(disulfur-34S)-S,S':S,S']]tris(dithio)-
 .mu.3-thioxo-34S-tri-, triangulo, diammonium, dihydrate (9CI) (CA
 INDEX NAME)



RN 127277-35-4 HCA
 CN Molybdate(2-), tris[.mu.-[(disulfur-34S2)-S,S':S,S]]tris(dithio-34S2)-.mu.3-thioxo-34S-tri-, triangulo, diammonium, dihydrate (9CI)
 (CA INDEX NAME)



IT 13965-97-4, Sulfur-34, reactions
 (redn. of, by sodium borohydride)
 RN 13965-97-4 HCA
 CN Sulfur, isotope of mass 34 (8CI, 9CI) (CA INDEX NAME)

34S

CC 78-7 (Inorganic Chemicals and Reactions)
 Section cross-reference(s): 73
 IT 127161-24-4P
 (prepn. and force const. and vibrational spectra of)
 IT 127161-22-2P 127161-23-3P 127211-93-2P
 127277-35-4P
 (prepn. and force consts. and vibrational spectra of)
 IT 13965-97-4, Sulfur-34, reactions
 (redn. of, by sodium borohydride)

L28 ANSWER 15 OF 20 HCA COPYRIGHT 2004 ACS on STN
 110:87381 Reaction of molybdenum chalcogenide halide and halide cluster
 compounds with ammonium polysulfide. Fedin, V. P.; Geras'ko, O. A.;
 Mironov, Yu. V.; Fedorov, V. E. (Inst. Neorg. Khim., Novosibirsk,
 USSR). Zhurnal Neorganicheskoi Khimii, 33(11), 2846-9 (Russian)

1988. CODEN: ZNOKAQ. ISSN: 0044-457X.

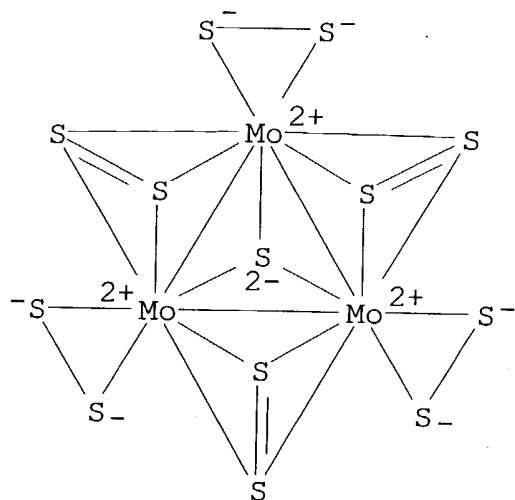
AB The reactions of MoS_2Cl_3 , MoS_2Cl_2 , $\text{K}_4\text{Mo}_2\text{Cl}_8$ and $\text{Mo}_3\text{S}_7\text{Br}_4$ with $(\text{NH}_4)_2\text{S}_x$ gave $(\text{NH}_4)_2(\text{Mo}_2\text{S}_{12}) \cdot 2\text{H}_2\text{O}$ and $(\text{NH}_4)_2(\text{Mo}_3\text{S}_{13}) \cdot 2\text{H}_2\text{O}$, the yields of which depended on the reaction temp. $\text{Mo}_3\text{Se}_7\text{Cl}_4$ reacted with $(\text{NH}_4)_2\text{S}_x$ to give $(\text{NH}_4)_2(\text{Mo}_3\text{Se}_7\text{S}_6) \cdot 2\text{H}_2\text{O}$.

IT 67031-31-6P

(prepn. of, from molybdenum chloro disulfido polynuclear complexes and ammonium polysulfide)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[μ -(disulfur- κ .S, κ .S': κ .S, κ .S')] μ tris(dithio)- μ .3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



● 2 NH_4^+

CC 78-7 (Inorganic Chemicals and Reactions)

IT 67031-31-6P 68417-00-5P

(prepn. of, from molybdenum chloro disulfido polynuclear complexes and ammonium polysulfide)

L28 ANSWER 16 OF 20 HCA COPYRIGHT 2004 ACS on STN

105:163795 Coordination chemistry of molybdenum- and tungsten-sulfur compounds and some aspects of hydrodesulfurization catalysis. Mueller, A. (Fac. Chem., Univ. Bielefeld, Bielefeld, 4800, Fed. Rep. Ger.). Polyhedron, 5(1-2), 323-40 (English) 1986. CODEN: PLYHDE. ISSN: 0277-5387.

AB A survey and a presentation of new results on the coordination chem. of Mo- and W-S compds. are presented. Included is a systematic

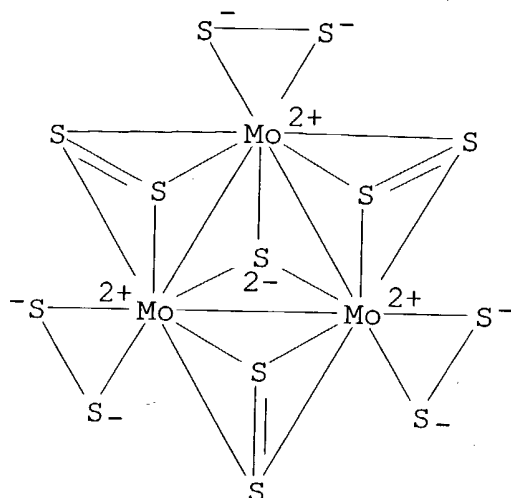
treatment of the compd. types with different functional groups and the different reaction types. Mol. models for cryst. MoS₂ and the nitrosylated CoMoS phase as well as for the promoting effect of the Co atoms on hydrodesulfurization catalysis are also discussed.

IT 67031-31-6P

(prepn. and reaction of, with tetraphenylarsonium chloride)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



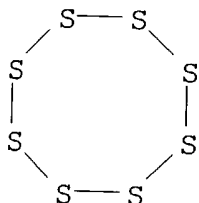
● 2 NH₄⁺

IT 10544-50-0, reactions

(reaction of, with tetrathiomolybdate)

RN 10544-50-0 HCA

CN Sulfur, mol. (S₈) (7CI, 8CI, 9CI) (CA INDEX NAME)



CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 67, 75

IT 67031-31-6P

(prepn. and reaction of, with tetraphenylarsonium chloride)

IT 10544-50-0, reactions

(reaction of, with tetrathiomolybdate)

L28 ANSWER 17 OF 20 HCA COPYRIGHT 2004 ACS on STN

100:166958 Synthesis, structure, and reactivity of the tetraethylammonium molybdate cluster $[(C_2H_5)_4N]_2[Mo_3(\mu_3-S)(\mu_2-S)_3(SCH_2CH_2S)_3]$: a cluster with sulfur "vacancies" and resonance Raman spectral similarity to iron sulfide (Fe_3S_4) proteins.

Halbert, T. R.; McGauley, K.; Pan, W. H.; Czernuszewicz, R. S.; Stiefel, E. I. (Corp. Res.-Sci. Lab., Exxon Res. Eng. Co., Linden, NJ, 07036, USA). Journal of the American Chemical Society, 106(6), 1849-51 (English) 1984. CODEN: JACSAT. ISSN: 0002-7863.

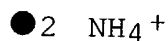
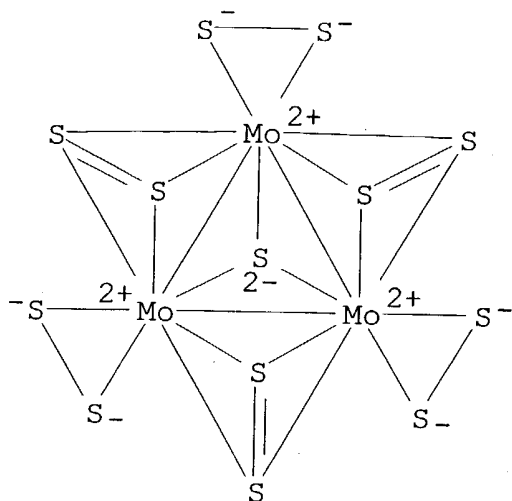
AB Solid $(NH_4)_2[Mo_3S(S_2)_6]$ and dry Et_4NBr react with excess (>9 equivs.) $Na_2[SCH_2CH_2S]$ in CH_3CN at room temp. for form $[Et_4N]_2[Mo_3S_4(SCH_2CH_2S)_3]$ (I) in good yield. Crystals of I form in space group $P2_1/n$ with a 13.694(4), b 13.654(4), c 20.013(4) .ANG., V = 3664(2) .ANG.³, Z = 4, and $R_{w} = 0.047$. The $Mo_3S_4(SCH_2CH_2S)_3$ anion contains an equilateral triangle of $Mo(IV)$ atoms ($Mo-Mo$ 2.77-2.79 .ANG.), 1 capping μ_3 -sulfido ligand and 3 bridging μ_2 -sulfido ligands. Each Mo ion is also coordinated by a single $-SCH_2CH_2S-$ chelating ligand. The arrangement of the S and Mo atoms in layers is related to the arrangement obsd. in solid MoS_2 . Solns. of I in CH_3CN react with stoichiometric amts. of S_8 or $C_6H_5CH_2SSSCH_2C_6H_5$ to form $[N(C_2H_5)_4]_2[Mo_3S_7(SCH_2CH_2S)_2]$ (II). Addn. of CN^- or PPh_3 to II regenerates I. This interconversion mimics the creation and filling of S vacancies often proposed as active sites on heterogeneous MoS_2 based hydrotreating catalysts. Finally, the resonance Raman spectrum of I shows a remarkable resemblance to the spectra of 3- Fe centers in certain Fe/S proteins, suggesting a possible structural analogy.

IT 67031-31-6

(reaction of, with disodium ethanedithiolate in presence of tetraethylammonium bromide)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[μ_2 -(disulfur- $\kappa S, \kappa S': \kappa S, \kappa S'$)]tris(dithio)- μ_3 -thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



IT 7704-34-9, reactions
(reactions of, with trimolybdenum sulfide ethanedithiolate or
trimolybdenum sulfide disulfide ethanedithiolate cluster)

RN 7704-34-9 HCA

CN Sulfur (8CI, 9CI) (CA INDEX NAME)

S

CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

IT 67031-31-6
(reaction of, with disodium ethanedithiolate in presence of
tetraethylammonium bromide)

IT 7704-34-9, reactions
(reactions of, with trimolybdenum sulfide ethanedithiolate or
trimolybdenum sulfide disulfide ethanedithiolate cluster)

L28 ANSWER 18 OF 20 HCA COPYRIGHT 2004 ACS on STN

93:124935 Novel sulfur-rich molybdenum compounds. Mueller, A.;
Bhattacharyya, R. G.; Eltzner, W.; Mohan, N.; Neumann, A.; Sarkar,
S. (Fac. Chem., Uni. Bielefeld, Bielefeld, 4800, Fed. Rep. Ger.).
Chem. Uses Molybdenum, Proc. Int. Conf., 3rd, 59-63. Editor(s):
Barry, H. F.; Mitchell, P. C. H. Climax Molybdenum Co.: Ann Arbor,
Mich. (English) 1979. CODEN: 43RZAV.

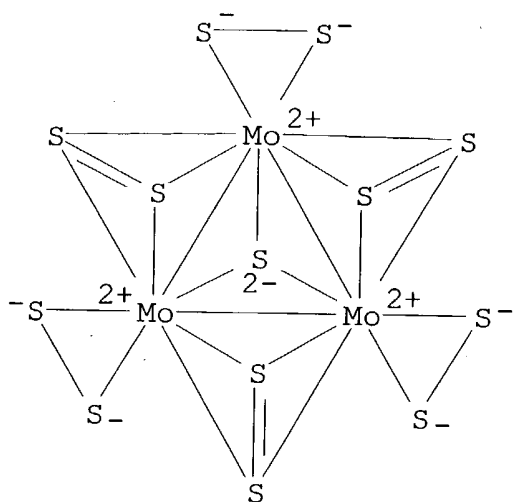
AB Novel S-rich Mo compds. with the anions $[\text{Mo}_3\text{S}(\text{S}_2)_6]^{2-}$, $[\text{Mo}_2(\text{S}_2)_6]^{2-}$, $[\text{Mo}_2\text{O}_2\text{S}_2(\text{S}_2)_2]^{2-}$, and $[\text{Mo}_4(\text{NO})_4\text{S}_3(\text{S}_2)_5]^{4-}$ are reported. The 1st 3 are obtained by means of an interesting redn. of Mo(VI) by Sx^{2-} in aq. soln. The investigation shows the high affinity of Mo in different oxidn. states for S and esp. for S_2^{2-} .

IT **67031-31-6P**

(prepn. of)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.a.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)



● 2 NH_4^+

CC 78-7 (Inorganic Chemicals and Reactions)
Section cross-reference(s): 75

IT **67031-31-6P** 68417-00-5P
(prepn. of)

L28 ANSWER 19 OF 20 HCA COPYRIGHT 2004 ACS on STN

90:145172 Simple preparation of the binary metal-sulfur clusters $[\text{Mo}_3\text{S}_{13}]^{2-}$ and $[\text{Mo}_2\text{S}_{12}]^{2-}$ from MoO_4^{2-} in practically quantitative yield. Mueller, Achim; Bhattacharyya, Ram Gopal; Pfefferkorn, Bernhard (Fak. Chem., Univ. Bielefeld, Bielefeld, Fed. Rep. Ger.). Chemische Berichte, 112(2), 778-80 (German) 1979. CODEN: CHBEAM. ISSN: 0009-2940.

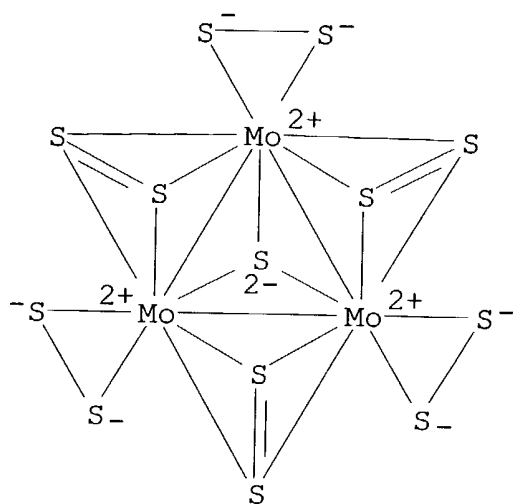
AB $(\text{NH}_4)_2[\text{Mo}_3\text{S}(\text{S}_2)_6]$ and $(\text{NH}_4)_2[\text{Mo}_2(\text{S}_2)_6] \cdot 2\text{H}_2\text{O}$ were prepd. by heating aq. MoO_4^{2-} with $(\text{NH}_4)_2\text{Sx}$ for several h.

IT 67031-31-6P

(prepn. of)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)

● 2 NH₄⁺

CC 78-7 (Inorganic Chemicals and Reactions)

IT 67031-31-6P 68417-00-5P

(prepn. of)

L28 ANSWER 20 OF 20 HCA COPYRIGHT 2004 ACS on STN

89:83976 Directed synthesis of tridecathiotrimolybdate(2-), an isolated cluster with sulfur atoms in three different bonding states. Mueller, Achim; Sarkar, Sabyasachi; Bhattacharyya, Ram Gopal; Pohl, Siegfried; Dartmann, Mechthild (Fak. Chem., Univ. Bielefeld, Bielefeld, Fed. Rep. Ger.). Angewandte Chemie, 90(7), 564-5 (German) 1978. CODEN: ANCEAD. ISSN: 0044-8249.

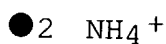
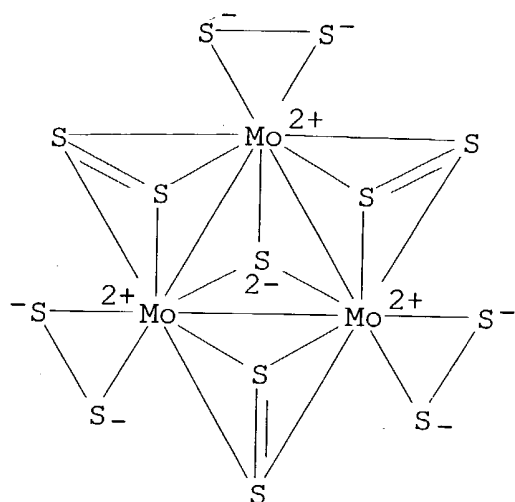
AB The Mo(IV) complex (NH₄)₂[Mo₃S(.mu.-S₂)₃(S₂)₃] (I) was prepd. by reaction of an aq. soln. of (NH₄)₆Mo₇O₂₄.4H₂O and NH₂OH.HCl with a satd. soln. of (NH₄)₂S_x or by direct reaction of MoCl₄(py)₂ with the polysulfide soln. I was characterized by chem. anal., thermogravimetry, DTA, magnetic measurements, single crystal structure anal., and ESCA, electronic, IR, and Raman spectra. I is very stable and it is insol. in H₂O but somewhat sol. in DMF. In I the Mo-Mo distance is 2.67 .ANG. and the coordination no. is 9.

IT 67031-31-6P

(prepn. and structure)

RN 67031-31-6 HCA

CN Molybdate(2-), tris[.mu.-(disulfur-.kappa.S,.kappa.S':.kappa.S,.kappa.S')]tris(dithio)-.mu.3-thioxotri-, triangulo, diammonium (9CI)
(CA INDEX NAME)

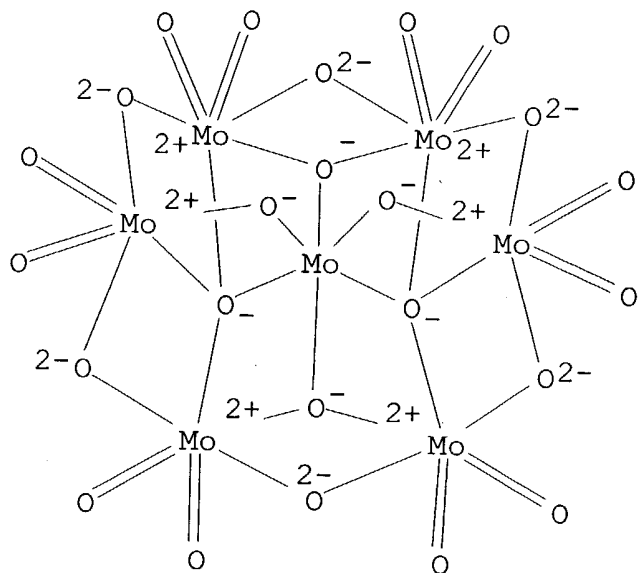


IT 12027-67-7

(reaction of, with hydroxylamine and ammonium polysulfide)

RN 12027-67-7 HCA

CN Molybdate (Mo70246-), hexaammonium (9CI) (CA INDEX NAME)



● 6 NH_4^+

CC 78-7 (Inorganic Chemicals and Reactions)

IT 67031-31-6P

(prepn. and structure)

IT 12027-67-7

(reaction of, with hydroxylamine and ammonium polysulfide)